제59회 한국분석과학회 추계 학술대회

The 59th Biannual Conference of
The Korean Society of Analytical Sciences

일 시 2017년 11월 8일(수) ~ 10일(금)
장 소 ICC JEJU
주 관 (사)한국분석과학회

협 찬

㈜지올코리아, 리코코리아, 비케이사이언티픽㈜, 서울대학교 공동기기센터 NICEM 분원, 써모피셔사이언티픽코리아㈜, 씨케이아이씨(CKIC)코리아, 오디랩, 인성크로마텍, ㈜가스테크, ㈜나노베이스, ㈜애니랩, ㈜어플라이드 스펙트라, ㈜주원, ㈜케이엠, ㈜코리아사이언텍, 한국생산기술연구원, 한국식품연구원 부설 세계김치연구소, 한국퍼킨엘머, 호리바코리아㈜, Phenomenex

사단법인 한국분석과학회
THE KOREAN SOCIETY OF ANALYTICAL SCIENCES

■ 목　　차 ■

〈초 록〉

〈총 회〉

〈기타 안내사항〉

초대의 글

새로운 변화와 계절의 결실로 다사다난한 연말을 맞이하고 있습니다. 다양한 과학 기술분야의 바탕 학문으로 그리고 새로운 변화에 대응하는 추진 동력으로 거듭 발전하고 있는 우리 학회가 만추의 계절에 그 간의 노력을 정리하고 결실을 맺기 위해 제59회 한국분석과학학회 추계 학술대회를 2017년 11월 8일(수) ~ 10일(금) 제주 국제컨벤션센터(ICC)에서 개최합니다. 우리학회 회원 여러분과 분석과학에 관심을 가지고 계신 모든 분들을 정중히 초대하고자 합니다.

이번 추계 학술대회에서는 학술적 더 깊이를 더하고 사회적 요구에 효율적으로 기여하고자 다양한 주제로 발표 분야를 확대하였습니다. 이를 위해 산·학·연·관이 참여하는 분야별 symposium, special session 및 최신 분석기술 특강 등으로 폭넓게 프로그램을 구성하였습니다. 또한 공동으로 개최하는 HPLC 2017 Jeju 국제 심포지움을 통해 국제적 위상을 확보하는데 기여하고자 하였습니다.

먼저 첫째 날에는 법의학 · 안전 분야, 화학 · 재료 분야, 표준 및 원자력 분야를 주제로 다양한 분야에서 이론과 응용에 대한 분석과학 연구의 성과와 동향이 발표되며, 둘째 날에는 의약학 분야의 첨단기술 분야에 연구자의 발표가 시작되고, 최신 분석기술 동향으로 새로운 기법과 유해화학물질 안전관리를 위한 분석기술이 소개될 예정입니다. 또한 사회적 관심이 높은 농약 및 POPs 분석기술에 대해 special session을 통하여 이와 관련된 각 분야 전문가가 공동으로 발표에 참여하는 기회를 마련하였습니다. 동시에 다양한 분야의 분석과학에 대한 비중 있는 전문가들의 종합적 발표를 통해 학문적 성과를 공유할 수 있도록 하였으며, 특히 여성과학기술인의 참여를 독려하고 있습니다. 그리고 대학원생 구두발표를 통해 젊은 과학자의 발전을 독려하고 학술적 교류가 이루어지도록 하였습니다. 이번 추계 학술대회는 총 300여 편의 구두 발표 및 포스터, 공동 개최하는 HPLC 2017 Jeju 의 발표자료 500여 편을 만날 수 있어 분석 과학자에게 보다 폭넓은 학술적 성과와 응용 동향을 조망할 수 있는 최고의 기회가 될 것입니다.

계절의 다양한 색깔을 입힌 제주에서 다양성을 추구하는 우리 학회가 개최하는 제59회 추계 학술대회를 통해 국내·외의 수준 높은 분석과학자 간의 건강한 학술적 교류의 공간이 되고, 과학기술의 영역에서 분석과학의 위치를 재확립하는 기회가 될 수 있도록 많은 성원을 부탁드립니다. 그리고 참석하신 모든 분들께서 휴식과 학술적 에너지를 재충전하는 자리가 되기를 기원합니다.

끝으로 이번 추계 학술대회를 성공적으로 개최할 수 있게 수고해 주신 조남준 학술부회장님과 각 분야 부회장님 등 참석해 주신 모든 회원 여러분들과 후원기관 및 기기전시 참여업체 관계자 분들께 거듭 깊은 감사의 말씀을 드립니다.

2017년 11월
사단법인 한국분석과학학회
회장 김 태 승 드림

학술대회 운영 공지 사항

1) 참가비 안내

2017년도 년 회비를 납부하지 않은 분은 년 회비 ₩30,000 (학생 ₩20,000)과 등록비를 함께 납부하여 주시기 바랍니다.

회원 구분		연회비	참 가 비	
			사전 등록비	당일 등록비
정회원	일반	30,000원	90,000원	100,000원
	학생	20,000원	50,000원	60,000원
비회원	일반		130,000원	
	학생		80,000원	

- 참가하시는 모든 회원께서는 필히 등록하시고, 학회장에서는 등록 명찰을 지참하여 주시기 바랍니다.
- 발표장 질서유지를 위해 명찰을 지참하지 않은 회원은 발표장 및 간친회장 입장이 제한될 수 있습니다.

2) 구두 발표

- 발표자에게 배정된 시간은 수상 강연 30분, 심포지엄 및 PI급 구두 강연 15분 ~ 20분, 대학원생 구두 발표 10분입니다.
- 발표자께서는 발표시간 세션 시작 전에 발표장에 도착하셔서 발표 자료를 도우미 학생에게 전달하시고 발표 내용을 현장에서 미리 확인하시길 바랍니다.
- 발표자께서는 배정된 시간의 2/3 발표 시간으로, 1/3 토의 시간으로 활용해 주시고 발표 시간을 엄수해 주시기 바랍니다.
- 좌장께서는 발표자가 배정 시간을 절대 초과하지 않도록 운영 바랍니다.

3) 포스터 발표

장 소	부착 시간	발표 일시	철수 시간
201호 및 로비	2017. 11. 9(목) 08:00-	2017. 11. 9(목) 11:30-12:30	2017. 11. 9(목) 12:30-13:00
	2017. 11. 9(목) 13:00-	2017. 11. 9(목) 16:40-17:40	2017. 11. 9(목) 17:40-18:00

- 포스터 규격은 가로 90㎝ × 세로 120㎝ 입니다. 발표 예정자는 이 크기에 적합하게 제목, 저자, 연구 내용을 준비하시면 됩니다.
- 발표자는 포스터 앞에서 정해진 시간 동안 대기하시어 질문과 토의에 응하셔야 합니다. 본회에 별도의 연락 없이 포스터를 게시하지 않으면 추후에 본인 뿐 아니라 해당 연구실의 차기 논문 발표에 제한이 있사오니, 유의하여 주시기 바랍니다.
- 철거하지 않은 포스터는 임의 폐기합니다.

※ 우수 포스터 4편, 대학원생 우수 구두 2편을 선정하여 2018년 춘계 학술대회에서 시상할 예정입니다.

4) Early Bird Seminar에서는 참석자에게 간단한 조식(샌드위치, 음료)과 경품이 제공됩니다. (선착순)

5) 기타 자세한 사항은 아래로 문의바랍니다

- 학회 사무실 담당 강미경: 02-701-8661

2017년도 추계 학술대회 프로그램

11월 08일(수)	202호	203호	로비 & 201호	5층(탐라홀)
13:00 -	등록			
14:00 - 15:20	Symposium I (법과학/안전)	Symposium II (화학/재료)		
15:20 - 15:30	Coffee Break & 기기 전시 참관			
15:30 - 16:50	Symposium III (표준/원자력)	PI급 구두 강연 I		
16:50 - 17:00	Coffee Break & 기기 전시 참관			
17:00 - 17:30				DI 분석과학상 수상강연
17:30 - 18:30				총회
18:30 -				간친회
11월 09일(목)	**202호**	**203호**	**로비 & 201호**	
08:00 -	등록 및 포스터 게시			
08:20 - 08:50		Early-Bird Seminar (주원)		
09:00 - 10:00	Symposium IV (의약학)	최신 분석기술 특강 I (Thermo)		
10:00 - 10:20		Leco 젊은 분석과학상 수상강연		
10:20 - 10:30	Coffee Break & 기기 전시 참관			
10:30 - 11:30	대학원생 구두 발표 I	최신 분석기술 특강 II (영인)		
11:30 - 12:30			포스터 발표 (PT 001~125)	
12:30 - 13:40	점심 식사			
13:40 - 15:00	Special Session I (식품/농업)	PI급 구두 강연 II		
15:00 – 15:10	Coffee Break & 기기 전시 참관			
15:10 - 16:30	Special Session II (환경)	대학원생 구두 발표 II		
16:30 - 16:40	Coffee Break & 기기 전시 참관			
16:40 - 17:40			포스터 발표 (PT 126~252)	
17:40 - 18:00	행운권 추첨			
11월 10일(금)	분석기관 및 산업시찰			
09:00 - 10:30	대기질 관리 모니터링 현장 교육(제주 대기측정소, NIER)			
11:00 - 13:00	산업현장 수질관리 및 수질분석 교육(삼다수)			

11월 08일(수), 202호

13:00 –	등록	로비
14:00 – 15:20	**Symposim I.** 법과학/안전	
	좌장: 권미아(국립과학수사연구원)	
14:00-14:20	**Simple synthesis and analysis of triacetone triperoxide (TATP): identification by NMR and UPLC-ESI-TOF-MS and comparative assessment of reaction yield through chemical precursors** Jin Hwan Lee (National Institute of Chemical Safety, Ministry of Environment)	
14:20-14:40	**The analysis of explosives for nationality or tracing origin by IRMS** Nam Yee kim (National Forensic Service)	
14:40-15:00	**New technologies in forensic DNA; Beyond STR** Si-Keun Lim (National Forensic Service)	
15:00-15:20	**Solid indicators for acid or base spills at chemical accidents** Ketack Kim (Sangmyung University)	
15:20 – 15:30	**Coffee Break &** 기기 전시	로비
15:30 – 16:50	**Symposim** Ⅲ. 표준/원자력	
	좌장: 김진석(한국표준과학연구원)	
15:30-15:50	**Reliability of chemical measurement** Jong Oh CHOI (Korea Research Institute of Standards and Science)	
15:50-16:10	**Gas analysis and international comparisons** Sangil Lee (Korea Research Institute of Standards and Science)	
16:10-16:30	**Study on CCl_4 alternative solvent for performance evaluation of permeability protection** Sungyool Bong (Korea Testing and Research Institute)	
16:30-16:50	**Ethics in analytical sciences** Seung-Woon Myung (Kyonggi University)	
16:50 – 17:00	**Coffee Break &** 기기전시	로비

11월 08일 (수), 203호

13:00 –	등록	로비
14:00 – 15:20	**Symposim Ⅱ. 화학/재료**	
좌장: 박신화(포항산업과학연구원)		
14:00-14:20	**Recent advances in mass spectrometry-based steroid profiling** Man-Ho Choi (Korea Institute of Science and Technology)	
14:20-14:40	**Statistical approach of alkylphenol ethoxylates** Nam-Yong Cheong (KATRI)	
14:40-15:00	**Fabrication of microextraction needle with polymeric sorbents** Sunyoung Bae (Seoul Women's University)	
15:00-15:20	**Augmented fluorescence-free 3D super-resolution microscopy using enhanced dark-field illumination based on wavelength-modulation and a least-cubic algorithm** Seong Ho Kang (Kyung Hee University)	
15:20 – 15:30	**Coffee Break &** 기기 전시	로비
15:30 – 16:45	**PI급 구두 강연 Ⅰ**	
좌장: 정영림(서울의약연구소)		
15:30-15:45	**Determination characteristics of volatile organic compounds in e-cigarette liquid samples based on headspace-GC/MS analytical technique** Sang-Hee Jo (Hanyang University)	
15:45-16:00	**Optimization of the analytical system for the CMIT/MIT aerosol analysis using the thermal desorption technique** Yong-Hyun Kim (Korea Institute of Toxicology)	
16:00-16:15	**Simultaneous determination of cyanobacterial toxins in river water by liquid chromatography-tandem mass spectrometry** In jung Lee (National Institute of Environmental Research)	
16:15-16:30	**Development and validation of 7 acidic pesticides residue methods based on QuEChERS** Hyo Young Kim (National Agricultural Products Quality Management Service)	
16:30-16:45	**Development and validation of single residue methods for benfuracarb, ethoxyquin, prohexadion-calcium, kasugamycin, and validamycin a based on QuEChERS** Chai Uk Lim (National Agricultural Products Quality Management Service)	
16:50 – 17:00	**Coffee Break &** 기기전시	로비

11월 08일(수), 5층 탐라홀

17:00 – 17:30	**DI 분석과학상 수상강연**
좌장: 홍종기(경희대학교)	
17:00-17:30	**Development of certified reference materials respond for technological and environmental regulation** Yle-Shik Sun (Korea Testing and Research Institute)
17:30 – 18:30	총회
18:30 –	간친회

11월 09일(목), 202호

08:00 –	등록 및 포스터 게시	로비
09:00 – 10:20	**Symposim Ⅳ.** 의약학	
	좌장: 류광현(경북대학교)	
09:00-09:20	**Metabolomics-guided metabolite profiling of itraconazole in human** Ju-Hyun Kim (Catholic University)	
09:20-09:40	**Content changes of phenolic compounds depending on the ripeness and processing method of Prunus mume fruits** Chong Woon Cho (Chungnam National University)	
09:40-10:00	**Analysis of neurosteroid profiles in brain and plasma in a stress-induced rat model** Hye Hyun Yoo (Hanyang University)	
10:00-10:20	**Association study between metabolomic profiling and bioactivity of crop diversity** Yongsoo Choi (Korea Institute of Science and Technology)	
10:20 – 10:30	**Coffee Break &** 기기전시	로비
10:30 – 11:30	대학원생 구두 발표 Ⅰ	
	좌장: 이재형**(**한국화학융합시험연구원**)**	
10:30-10:40	**The occurrence characteristics of heavy metals via vaping of electronic cigarette device** Chae-Jin Na (Hanyang University)	
10:40-10:50	**A study on gaseous pollutants concentrations in meat cooking with micro-environmental conditions** Hyun Ah Ji (National Institute of Environmental Research)	
10:50-11:00	**Determination of phthalates in e-cigarette liquid and vapor samples based on quartz wool tube sampling and GC-MS approach** Jae-Won Shin (Hanyang University)	
11:00-11:10	**Development of QCM gas sensor with β-CD as selector for sensing 2-nonenal** Hak-Jun Do (Hannam University)	
11:10-11:20	**Chemical profiling in surface waters using two types of polar organic chemical integrative sampler (POCIS)** Yoonah Jeong (Korean Institute of Science and Technology Europe, RWTH Aachen University)	
11:20-11:30	**Development of sampling and analysis approach for tobacco specific nitrosamines in e-cigarette liquid and aerosol samples** Yoon-Seo Lee (Hanyang University)	
11:30 – 12:30	포스터 발표	로비 및 **201**호
12:30 – 13:40	점심 식사	
13:40 – 15:00	**Special Session** Ⅰ. 식품 중 농약 분석	
	좌장: 김동술**(**식품의약품안전평가원**)**	
13:40-14:00	**Analytical methods of pesticide residues in the food code** Jung-Ah Do (MFDS)	
14:00-14:20	**A review on status of pesticides registration in korea** ByungJun Park (National Institute of Agricultural Sciences)	
14:20-14:40	**Development of rapid analytical method for glyphosate residue in agricultural products using HPLC- MS/MS** Hyunjeong Cho (National Agricultural Products Quality Management Service)	
14:40-15:00	**Pesticide residue analysis in environmental samples** Jong-Woo Park (Analysis Technology and Tomorrow Ltd.)	
15:00 – 15:10	**Coffee Break &** 기기전시	로비
15:10 – 16:30	**Special Session** Ⅱ. 잔류성 유기오염물질 **(POPs)** 분석	

좌장: 최은경(한국생산기술연구원)		
15:10-15:30	**Long-Range atmospheric transport of particulate matters and persistent organic pollutants** Sung-Deuk Choi (Ulsan National Institute of Science and Technology)	
15:30-15:50	**Analytical methods for organochlorine pesticides (OCPs) in sediment cores** Heesoo Eun (National Agriculture and Food Research Organization, Japan)	
15:50-16:10	**Study on the POPs national standard method of decabromodiphenyl ether in Korea** In-Young Chung (National Institute of Environmental Research)	
16:10-16:30	**Analysis method of chlordecone and PCNs** Geum-Ju Song (POSTECH)	
16:30 – 16:40	**Coffee Break &** 기기전시	로비
16:40 – 17:40	포스터 발표	로비 및 **201**호
17:40 – 18:00	행운권 추첨	

11월 09일(목), 203호

08:00 –	등록 및 포스터 게시	로비
08:20 – 08:50	**Early Bird Seminar**	
		좌장: 남궁현(코오롱분석평가연구소)
08:20-08:50	**Micro sampling techniques for analysis (Axis-Pro)** Jeong-wan Kim (JOOWON INDUSTRIAL CO., LTD)	
09:00 – 10:00	최신 분석기술 특강 Ⅰ	
		좌장: 조남준(한국기술교육대학교)
09:00-09:30	**Identify more unknowns and find real difference using complete discovery solution for small molecule identification and characterization** Hansun Kwon (Thermo Fisher Scientific)	
09:30-10:00	**HPLC method development for efficient analysis and introduce of thermo accucore column** Jungwoo Lee (Thermo Fisher Scientific)	
10:00 – 10:20	**Leco** 젊은 분석과학자상 수상강연	
		좌장: 황승율(화학물질안전원)
10:00-10:20	**Deep eutectic solvents as an efficient medium for one-step sample preparation for the chemical characterization of aromatic herbs** Jeongmi Lee (Sungkyunkwan University)	
10:20 – 10:30	**Coffee Break &** 기기전시	로비
10:30 – 11:30	최신 분석기술 특강 Ⅱ	
		좌장: 팽기정(연세대학교)
10:30-11:30	**Recent analytical technologies for foods and consumer products safety issues** Kyung Hoon Cha (Young In Scientific Co., Ltd.)	
11:30 – 12:30	포스터 발표	로비 및 **201**호
12:30 – 13:40	점심 식사	
13:40 – 15:10	**PI**급 구두 강연 Ⅱ	
		좌장: 김원석(서도비엔아이)
13:40-13:55	**Age-dating of the cremated remains and the ink sticks by the accelerator mass spectrometry (AMS)** BoKyeong Guem (Korea Institute of Science and Technology)	
13:55-14:10	**Anaysis of trace elements in low-melting metals using GD-MS** Jae-sik Yoon (Korea Basic Science Intistitute)	
14:10-14:25	**Application of supercritical fluid chromatography to examination of LCD cell materials and their impurity** KyuSung Heo (LG Display)	
14:25-14:40	**Uranium speciation in groundwater using laser spectroscopy** Euo Chang Jung (Korea Atomic Energy Research Institute)	
14:40-14:55	**Applications of cryogenic method to water vapor sampling from ambient air for isotopes analysis** Jeonghoon Lee (Ewha Womans University)	
14:55-15:10	**Water quality improvement of small water supply systems in rural area** Chang-gyun Lee (Chungcheongnam-do Institute of Health & Environmental Research)	
15:10 – 16:30	대학원생 구두 발표 Ⅱ	
		좌장: 박종호(한국원자력연구원)
15:10-15:20	**Development of anion-exchange membrane with highly cross-linking and large size ion-channel for non-aqueous vanadium redox flow battery** Hu-Geun Kwon (Hannam University)	

15:20-15:30	**Insights into the sorptive removal of sulfur and volatile organic compounds by a metal organic framework (MOF)** Min-Hee Lee (Hanyang University)	
15:30-15:40	**Surface plasmon- resonance analysis for the interaction between human sweet taste receptors and sweeteners** Hyun-Joo Jo (Chung-Ang University)	
15:40-15:50	**Synthesis and application of polyphenylene conductive polymers as electron-transfer mediator** Da-Seul Kim (Hannam University)	
15:50-16:00	**Removal efficiency of reduced sulfur compounds (RSCs) in relation to the mass of the adsorbents**. Minkyu Cho (Hanyang University)	
16:00-16:10	**Shedding new light on the fundamental mechanisms by which styrene-butadiene-styrene (SBS) affects asphalt binder performance** Nader Nciri (Korea University of Technology and Education)	
16:10-16:20	**A monitoring study of ultra-fine particles depending on meat cooking methods** Soo Ran Won (National Institute of Environmental Research)	
16:20-16:30	**Ultra-sensitive immunotargeting of tumor necrosis factor-alpha based on plasmonic single nanoparticle by one shot dual-code 3D enhanced dark-field super-resolution microscopy** Soyeong Ju (Kyung Hee University)	
16:30 – 16:40	**Coffee Break &** 기기전시	로비
16:40 – 17:40	포스터 발표	로비 및 **201**호

포스터 발표 목록

*: 교신저자, _(밑줄): 발표자

원자력/방사선: PT 001 ~ 019

PT-001 Treatment of washing solution of uranium-contaminated soil
Seung Soo Kim*, Gye Nam Kim, Doo Seong Hwang and Jong Won Choi
Decommissioning Waste Control Team, Korea Atomic Energy Research Institute, Daejeon 34057, Korea

PT-002 Evaluation of metallic fuel rodlets for irradiation testing in the BOR-60 fast reactor
Jong-Hwan Kim*, Jung-Won Lee, Ki-Hwan Kim, Seok-Jin Oh, Seoung Woo Kuk, and Jeong-Yong Park
SFR fuel development division, Korea Atomic Energy Research Institute, Daejeon 34057, Republic of Korea

PT-003 Annual usage of feed water and electric power of HANARO research reactor
Won-ho IN[1], Sang-jin KIM, Cheong-won KIM and In-hyuk KANG
[1]HANARO Management Division, Korea Atomic Energy Institute, Daejeon 305-353 Republic of Korea

PT-004 Improvement of uranium ion signal intensity of thermal ionization mass spectrometry by graphite deposition
Jong-Ho Park[1,2]*
[1]Nuclear Chemistry Research Division, Korea Atomic Energy Research Institute, Daejeon 34057, Korea
[2]Department of Radiochemistry & Nuclear Non-proliferation, University of Science and Technology,
Daejeon 34113, Korea

PT-005 Determination of the neodymium isotopic ratios for a spent nuclear fuel with samarium impurity by thermal ionization mass spectrometry
Yang-Soon Park*, Byungman Kang, Jung-Suk Kim, and Yeong-Keong Ha
Nuclear Chemistry Research Division, Korea Atomic Energy Research Institute, 111, Daedeok-daero 989beon-gil, Yuseong-gu, Daejeon 34057, Republic of Korea

PT-006 Determination of Pu-241 of femtogram level without separation of Am-241 by thermal ionization mass spectrometry
Yang-Soon Park*, and Jong-Ho Park
Nuclear Chemistry Research Division, Korea Atomic Energy Research Institute,
111, Daedeok-daero 989beon-gil, Yuseong-gu, Daejeon 34057, Republic of Korea

PT-007 Preliminary study on implantation of hydrogen ion into SUS 316L and It's depth profiles
Na-Ri Lee, Hani Baek, Jong Hwa Moon, Yong Sam Chung, Gwang-Min Sun*
Neutron Utilization Research Division, Korea Atomic Energy Research Institute, 989-111 Daedeok-daero, Yuseong-gu, Daejeon, Korea

PT-008 Preparation for implementation of k0 standardization method in INAA
Ki-Man Lee* and Gwang-Min Sun
Neutron Utilization Research Department, Korean Atomic Energy Research Institute, 989-11 Daedeok-daero, Yuseong-gu, Daejeon, Korea

PT-009 Design of an analysis algorithm for detecting all fake gold bar candidates using PGAA
Ki-Man Lee* and Gwang-Min Sun
Neutron Utilization Research Department, Korean Atomic Energy Research Institute, 989-11 Daedeok-daero, Yuseong-gu, Daejeon, Korea

PT-010 An analysis of liquid radioactive waste in HANARO (2006~2016)
Cheong-won KIM[1], Won-ho IN, Hyung-jin AN, and Soon-ock HUR
[1]HANARO Management Division, Korea Atomic Energy Institute, Daejeon 305-353 Republic of Korea

PT-011 Rapid determination of Pu isotopic ratio and concentration using alkali fusion and ICP-MS

Jong-Myoung Lim[1*], Ji-Young Park[1], Hyun-Woo Lee[1,2], Hyuncheol Kim[1], Sang-Do Choi[1], and Wan-Ro Lee[1]
[1]Nuclear Emergency and Environmental Protection Division, Korea Atomic Energy Research Institute, Dejeon, 34057, Korea,
[2]Department of Environmental Engineering, ChungNam National University, Daejeon 305-764, Korea

PT-012 A study on room temperature adsorption for determination of atmospheric radioactive krypton(^{85}Kr)

Ji-Young Park[1*], Jong-Myoung Lim[1], Hyuncheol Kim[1], Wanno Lee[1]
[1]Nuclear Emergency and Environmental Protection Division, Korea Atomic Energy Institute, Daejeon 34057, Korea

PT-013 Detection of laser-ionized uranium using sputtered neutral mass spectrometry

Jinkyu Park[1]*, Tae Hee Kim[1], Chi-Gyu Lee[1], Sang Ho Lim[1] and Sun Ho Han[1]
[1]Nuclear Chemistry Research Division, Korea Atomic Energy Research Institute, 989-gil 111, Daedeok-daero, Yuseong-gu, Daejeon, 34057, Republic of Korea

PT-014 Quantitative analysis of uranium concentration in LiCl-KCl-UCl$_3$ matrix using Laser-Induced Breakdown Spectroscopy

Bo-Young Han[1]*, Dong-Seon Kim[2], Se-Hwan Park[3] and Seong-Kyu Ahn[3]
[1]Neutron Utilization Research Division, KAERI, Daejeon, 34057, Korea
[2]Meerecompany Inc., 69-12 Jeongmunsongsan-ro, Yanggam-myeon, Hwaseong-si, Gyeonggi-do, 18630, Korea
[3] Nuclear Fuel Cycle Strategy Division, KAERI, Daejeon, 34057, Korea

PT-015 A direct and sequential separation using TEVA and UTEVA for determination of U and Th in solid sample matrix

Hyeon-Woo Lee[1,2], Jong-Myoung Lim[1], Ji-Young Park[1], and Jin-Hong Lee[2*]
[1]Nuclear Emergency and Environmental Protection Division, Korea Atomic Energy Research Institute, Dejeon, 34057, Korea
[2]Department of Environmental Engineering, ChungNam National University, Daejeon 305-764, Korea

PT-016 Dissolution of glass using a hot plate for measurement of nuclide's radioactive activity

Kwang-Soon Choi[1]*, Jaesik Hwang[1], Simon Oh[1], Yang Soon Park[1], Hong Joo Ahn[1]
[1]Nuclear chemistry research division, Korea atomic energy research institute, Daedeok-daero 989-111, Yuseong-gu, Daejeon, Korea

PT-017 Precision and accuracy comparison of uranium isotopic analysis using multi-collector system in a TIMS

Kahee Jeong[1]* and Jong-Ho Park[2]
[1]KHNP-CRI, 70-1312 gil, Yuseong-daero, Yuseong-gu, Daejeon34101, Korea
[2]Nuclear Chemistry Research Division, Korea Atomic Energy Research Institute, 111 Daedeok-daero-989, Yuseong-gu, Daejeon 34057, Korea

PT-018 Physical detection characteristics of irradiated several nuts, sesame and perilla seed with different radiation sources and irradiation doses

Dae-Jung Kim*, Jae-Min An, Hee-Chang Shin, Kyong-Suk Hong, Ho-Jin Lee
Division of Safety Analysis, National Agricultural Products Quality Management Service,
Gimcheon, Gyeongbuk 39660, Korea

PT-019 Uraium and thorium isotopes analysis in soil

Bumsung Park[1], Jeong Hee Han[1]*, Jeong-ki Yoon[2], Ji-In Kim[2], Hyun-koo Kim [2]
[1]Korea Basic Science Institute, Earth and Environmental Research Center, Korea, 28119
[2]National Institute of Environmental Research, Soil and Groundwater Research Division, Incheon, Korea Incheon, Korea, 22689

식품/농학: PT 020 ~ 066

PT-020 Detection of the amphetamine-like substances in dietary supplement by LC-PDA and LC-MS/MS
Cheon-Ho Jo, Jisuk Yun, Yang sehee, Jae-Hwang Lee, Yoo-Kyung Jeong, Jangduck Choi, and Kisung Kwon
Substances Team, Department of Food Safety Evaluation, National Institute of Food and Drug Safety Evaluation, Ministry of Food and Drug Safety, South Korea

PT-021 Validation of indirect determination of MCPD esters and glycidyl esters in edible oils
Bo Kyung Suh, Yoo Kyung Jung, Jeong Ock Joo, Hyun Doo Song, Jang Duck Choi and Ki Sung Kwon*
New Hazardous Substance Team, National Institute of Food and Drug Safety Evaluation, Ministry of Food and Drug Safety, Cheongju 28159, Korea

PT-022 Improvement of screening method of multi-residue veterinary medicines in livestock by LC-MS/MS
Sujeong Han, Jiyoon Jeong, Sang-Mok Lee*, Sa Rang Lim, So Young Jo and Gyu-Seek Rhee
Pesticide and Veterinary Drug Residues Division, Food Safety Evaluation Department, National Institute of Food and Drug Safety Evaluation, Ministry of Food and Drug Safety, Osong, Cheongju, Chungbuk 28159, Korea

PT-023 Development of a multi-residue method for macrolide antibiotics in livestock and fishery products using LC-MS/MS
Sa Rang Lim, Jiyoon Jeong, Sang-Mok Lee*, Sujeoung Han, So Young Jo and Gyu-Seek Rhee
Pesticide and Veterinary Drug Residues Division, Food Safety Evaluation Department, National Institute of Food and Drug Safety Evaluation, Ministry of Food and Drug Safety, Osong, Cheonju, Chungbuk 28159, Korea

PT-024 Development of the analytical method for insecticide tetraniliprole determination in agricultural commodities using LC-MS/MS
Jung-Ah Do, Seung-Hee Lim, Shin-Min Park, Ji Hye Yoon, Won-Min Pak, Hye-Sun Shin, Hyung-Wook Chung and Gyu-Seek Rhee*
Pesticide and Veterinary Drug Residues Division, Food Safety Evaluation Department, National Institute of Food and Drug Safety Evaluation, Ministry of Food and Drug Safety, Cheongju, Chungbuk 28159, Republic of Korea

PT-025 Development of simultaneous analytical method for determination of imidacloprid and its metabolites in chicken and egg using LC-MS/MS
Jung Ah Do, Shin-Min Park, Seung-Hee Lim, Won-Min Pak, Ji Hye Yoon, Hye-Sun Shin, Hyung-Wook Chung, and Gyu-Seek Rhee*
Pesticide and Veterinary Drug Residues Division, Food Safety Evaluation Department, National Institute of Food and Drug Safety Evaluation, Ministry of Food and Drug Safety, Cheongju, Chungbuk 28159, Republic of Korea

PT-026 Development of the analytical method for determination of antibiotic streptomycin residues in agricultural products using LC-MS/MS
Jung-Ah Do, Ji Hye Yoon, Seung-Hee Lim, Shin-Min Park, Won-Min Pak, Hye-Sun Shin, Hyung-Wook Chung and Gyu-Seek Rhee*
Pesticide and Veterinary Drug Residues Division, Food Safety Evaluation Department, National Institute of Food and Drug Safety Evaluation, Ministry of Food and Drug Safety, Cheongju, Chungbuk 28159, Republic of Korea

PT-027 Development of the analytical method for determination of herbicide acetochlor and its metabolites in agricultural commodities using LC-MS/MS
Jung-Ah Do, Won-min Pak, Seung-Hee Lim, Shin-Min Park, Ji-Hye Yoon, Hye-Sun Shin, Hyung-Wook Chung and Gyu-Seek Rhee*
Pesticide and Veterinary Drug Residues Division, Food Safety Evaluation Department, National Institute of Food and Drug Safety Evaluation, Ministry of Food and Drug Safety, Cheongju, Chungbuk 28159, Republic of Korea

PT-028 Setting of ADI for MRLs establishment of insecticide fluxametamide

Jung Ah Do, Hye-Sun Shin, Seung-Hee Lim, Ji Hye Yoon, Shin-Min Park, Won-Min Pak, Hyung-Wook Chung and Gyu-Seek Rhee*
Pesticide and Veterinary Drug Residues Division, Food Safety Evaluation Department, National Institute of Food and Drug Safety Evaluation, Ministry of Food and Drug Safety, Cheongju, Chungbuk 28159, Republic of Korea

PT-029 A new analytical method of β-phenyl ethyl amines in foods and dietary supplements

Moo Song Lim, Eun Jeong Kim, Hye Soon Kang, Eun Jung Jang, Yong Woo Shin, Miok Kim, Ki Mi No,
Yu kyung Lee, Ji-Yong Yang, Joong Hoon Cho, Chul-Joo Lim and Sun-Ok Choi[1*]
[1]Division of Hazardous Substances Analysis,
Gyeongin Regional Office of Food and Drug Safety, Incheon 22133, Korea

PT-030 Establishment of anlaytical condition for 24 pesticides in livestock products using GC/NPD

Hye Soon Kang, Eun Jeong Kim, Moo Song Lim, EunJung Jang, YongWoo Shin, Miok Kim, Ki Mi No, Yukyung Lee, Ji-Yong Yang, Joong Hoon Cho, Chul-Joo Lim and Sun-Ok Choi[1*]
[1]Division of Hazardous Substances Analysis, Gyeongin Regional Office of Food and Drug Safety, Incheon 22133, Korea

PT-031 Validation of event specific quantitative real-time PCR method for GM alfalfa J101 and J163 in south korea

Myeong-ae Kim*, Hyung-il Kim, Eun-ju Song, Dong Hyuk Seo, Eungui Kang, Chul Joo Lim and Sun Ok Choi
Division of Hazardous Substances Analysis, Center for Food and Drug Analysis
Gyeongin Regional Office Of Food & Drug Safety, South Korea

PT-032 Analytical method development of silymarin for the health functional food

Jin Hee Lee, Kyung Jin Lee, Ji Eun Park, Yang Sun Kim, Eun Hee Keum, Mee Hyun Cho, Min Hye Seong,
Mi Hyune Oh, Chul Joo Lim, Meehye Kim
Imported Food Analysis Division, Gyeongin Regional Food and Drug Administration, Ministry of Food and Drug Safety, Incheon, Republic of Korea

PT-033 Monitoring of 75 veterinary drug residues for fishery products on the Korean market with LC-MS/MS

Eunhye Lee, Sooyeon Choi, Seonhye Jo, Younggi Jung, Hyunjeong You, Joonshik Park, Mikyoung Jin,
Sookhee Ha, Jaeyoung Shim, Kwangsoo Yoo, Gyeongyeol Kim, Kwangsoo Lee, Dongsul Kim, Changhee Lee*
Center for Food and Drug Analysis, Busan Regional Office of Food and Drug Administration, Ministry of Food and Drug Safety, Republic of Korea

PT-034 qPCR Based Quantification Method Validation for GM Canola DP073496-4 and MON88302

Hoyong Lee[1], Hee-Sook Lee[1], Sungho Woo[1], Seung-Jin Hong[1], Su-Ok Kim[1], Sang-Yub Kim[1], Dong-Sul Kim[1], and Woo-Seong Kim*
[1]Busan Regional Office of Food and Drug Safety, Korea

PT-035 Pesticide residue monitoring in livestock products by GC-ECD

Ho-Won Chang*, Nam Suk Kang, Yoon Jung Kang, Do Hyeong Kim, Se Ra Won, Hyang Min Ahn, Su Jin Kim,
Su Zie Choi, Kyeong Jun Kim, Si Woo Bark, Gil Ran Kang, Jae I Kim, Woo Seong Kim and Dong-Sul Kim
Busan Regional Korea Food and Drug Administration, Shinseon-Ro 356, Korea

PT-036 Development and validation of a LC-MS/MS method for determination of spiroxamine residue in food

Ju Hee Kuk, Yun Mi Chung, Sun Ok Han, Dong Ho Lee*, and Soon Young Han
Hazardous Substances Analysis Division, Gwangju Regional Office of Ministry of Food and Drug Safety, Gwangju, Korea

PT-037 Discrimination of geographical origin of rice by mass spectrometer-based electronic nose

Young Dae Choi, Byeong-Gon Sin, Ji-Hye Lee, Da-Jung Jung, Seul-hye Hur, Seong-Hun Lee*
Experiment Research Institute, National Agricultural products Quality management Service

PT-038 Development of methods to discriminate the geographical origin of rice (Oryza sativa) using fourier transformed near-infrared spectroscopy

Hyun Jung Kim, Byeong Gon Sin, Dong Jin Kang, Ji hye Lee, Da Jung Jung, Seong Hun Lee*
Experiment Research Institute, National Agricultural products Quality management Service

PT-039 Origin discrimination of carrots using UHPLC-Q-Orbitrap HRMS with multivariate analysis

Dong-Jin Kang, Eun-Hee Chang, Young-Dae Choi, Byeung-Kon Shin, Ji-Young Moon, Seong-Hun Lee*
Experiment Research Institute of National Agricultural Products Quality Management Service,
141, Yongjeon-ro, Gimcheon-si, Gyeongsangbuk-do, 740-220, Korea

PT-040 Development of simultaneous multi-residue analysis for 13 growth promoters in field/paddy soil using LC-MS/MS

Hee-Chang Shin[1*], Kyong-Suk Hong[1], Jae-Min An[1], Dae-Jung Kim[1], Sung-Youn Kim[1], Song-Yi Gu[1],
Ho-Jin Lee[1] and Sang-Kyun Oh[1]
[1]Division of Safety Analysis, Experiment & Research Institute National Agricultural Products Quality Management Service, Korea

PT-041 Development of analytical method for chromium species separation in agricultural products and soils

Jae-Min An[1]*, Kyong-Suk Hong, Dae-Jung Kim, Hee-Chang Shin, Ho-Jin Lee, Sang-Kyun Oh
[1]Division of Safety Analysis, Experiment & Research Institute, National Agriculture Products Quality Management Service, Korea

PT-042 Establishment of pre-harvest residue limit for pesticides in cow parsnip

Sujeong Shin*, Jungmi Keum, Dae Han Park, Ik Ro Kim, Gwang Hee Lee, Min Kyoung Kim
National Agricultural Products Quality Management Service, Daegu 414234, Korea

PT-043 Development of HPLC-UV method for the detection and quantification of 30 ginsenoside in processed red ginseng products

Mi Jin Lee, Hye Jin Kim, Min Hee Jeong, Ho Jin Kim*
National Agricultural Products Quality Management Service, Gimcheon 740-871, Korea

PT-044 Discrimination analysis of production year of rice based on mass spectrometer

Cho Ji Mi[1], Kim Yeon Kyoung[1], Park Jong Hee, Choi Jae Tae, Jeong Ji Wan, Park Mi Jeong, Lee Jae Geun,
Lee Dong Pil, Noh Seung Bae, Kim Ju Young, Lee Sung Woo*
National Agricultural Products Quality Management Service

PT-045 Determination of matrine and oxymatrine in processed foods by LC-MS/MS

Hyung Joo Kim*, Seung-sik Min, Jin-il Jeong, Su Jin Ahn, Sanghwan In
Forensic Toxicology Division, National Forensic Service, Wonju, Korea

PT-046 Optimization of SPME-based sample preparation method for detection of low concentration compound

Joo Hee Chung, Cheolho Yoon
Seoul Center, Korea Basic Science Institute, Seoul 02855, Korea

PT-047 Geographical origin of garlic and onion using multiple isotopes

Seunghyun Choi[1,2], Yeon-Sik Bong[2]*, Hyungsuk Kim[2], and Hyein Im[2]
[1]Graduate School of Analytical Science and Technology, Chungnam National University, Daejeon 34134, Korea
[2]Division of Earth & Environmental Sciences, Ochang Center, Korea Basic Science Institute, Chungbuk 28119, Korea

PT-048 Rapid characterization of bioactive phenolic and carotenoid derivatives in the fruits of green pepper (Capsicum annuum L.) using UPLC-ESI-Q-TOF/MS/MS analysis

Deullae Min, Jae Hyeong Jeong, Hwa Sung Lee, Jin Hwan Lee, Kyun Kim, Seung-Ryul Hwang*
[1]Division of Research Development and Education, National Institute of Chemical Safety, Ministry of Environment, Daejeon 34111, Korea

PT-049 The research for improving of quantitative test of methyl ρ-hydroxybenzoate as food additives

Su-Jeong Lee[1], Eun Mi Seo, Min Hee Kim, Ji Young Kim, Jang-Hyuk Ahn[1,2]*
[1]Department of Research & Development, Fore Front TEST, Republic of Korea
[2]Food Science & Technology, CHA University, Republic of Korea

PT-050 Development of analytical method for artificial sweeteners in fatty food

Min hee Kim[1], So Na Kim[1], Su jeong Lee[1], Jun Kyu Yang[1], Eun mi Seo[1], Ji young Kim[1], Jang-Hyuk Ahn[1,2,*]
[1]Department of Research & Development, Fore Front TEST, Republic of Korea
[2]Food Science & Technology, CHA University, Republic of Korea

PT-051 Analysis of volatile compounds in soy sauce using solid-phase microextraction arrow

Junyoung Lee[1], Haekwon Kim[2], Yunyeol Lee[1], Hae Won Jang[1,*]
[1]Food Analysis Center, Korea Food Research Institute
[2]Thermo Fisher Scientific Korea

PT-052 Analysis of volatile compounds in various foods using Headspace Stir Bar Sorptive Extraction (HS-SBSE)

Yunyeol Lee[1], Jun-young Lee[1] and Hae Won Jang[1*]
[1]Food Analysis Center, Korea Food Research Institute, Anyangpangyo, Bundang, Seongnam, Gyeonggi, 13539, Korea

PT-053 Rapid and accurate determination of major isoquinoline alkaloids by UPLC-ESI-Q-TOF and its application to extract of medicinal plant

Won Tea Jeong, Chang Gyun Park, Hun Ki Cho, Dong Ho Kim, Hyung Ryul Lee and Heung Bin Lim*
[1]Department of Industrial Crop Science & Technology, Chungbuk National University, Cheongju 28644, Korea

PT-054 Simultaneous determination of indole alkaloids by UPLC-ESI-Q-TOF and its application to medicinal plant

Won Tea Jeong, Hun Ki Cho, Chang Gyun Park, Dong Ho Kim, Hyung Ryul Lee and Heung Bin Lim*
[1]Department of Industrial Crop Science & Technology, Chungbuk National University, Cheongju 28644, Korea

PT-055 The effect of heat treatment on the reduction of MPN(4′-O-methylpyridoxine) in ginkgo biloba seed

Dong Ho Kim, Won Tae Jeong, Chang Gyun Park, Hyun Ki Cho, Hyeong Ryeol Lee and Heung Bin Lim*
Department of Industrial Crop Science and Technology, Chungbuk National University, Cheongju, 28644, Korea

PT-056 Effects on Plaque, Calculus Accumulation, and Gingivitis of Weissella cibaria CMU in Beagle Dogs having halitosis

Gyu-Seo Bae[1], Jeong-hee An[1], Ho-Eun Park[1], Kyung-Hyo Do[1], Mi-Sun Kang[2], Jong-Tae Kim[2]
and Wan-Kyu Lee[1]*
[1]Department of Veterinary Bacteriology, College of Veterinary Medicine, Chungbuk National University, Cheongju 28644, Korea
[2]Oradentics Co., Ltd., 3F KM Building 23, Teheran-ro 77-gil, Seoul 06157, Korea

PT-057 Effects of Weissella cibaria on halitosis and oral bacteria in Beagle Dogs

Jeong-hee An[1], Gyu-seo Bae[1], Ho-Eun Park[1], Kyung-Hyo Do[1], Mi-Sun Kang[2], Jong-tae Kim[2]
and Wan-Kyu Lee[1]*
[1]Department of Veterinary Bacteriology, College of Veterinary Medicine, Chungbuk National University, Cheongju, Republic of Korea. [2]Oradentics Co., Ltd., 3F KM Building 23, Teheran-ro 77-gil,
Gangnam-gu, Seoul 06157, Korea

PT-058 Various parameters influencing the performance of enzyme linked aptamer assay - especially effect of buffer

Soyeon Kwon, Insook Rhee*
Department of Chemistry, Seoul Women’s University, Seoul 01797, Korea

PT-059 Advantage sensitivity in enzyme linked aptamer assay with DNA homolog of the RNA tetracycline aptamer

Jimin Oh, Bomi Kim, Eunji Park, Insook Rhee*
Department of chemistry, Seoul Women’s University, Seoul 01797, Korea

PT-060 Oligonucleotide-based enzyme linked aptamer assay for detection of tetracycline in milk samples
Eunji Park[1], Ki-Jung Paeng[2], Insook Rhee[1,*]
[1]Department of Chemistry, Seoul Women's University, Seoul 01797, Korea
[2]Department of Chemistry, Yonsei University, Wonju 26493, Korea

PT-061 Pattern analysis of bio-converted mulberry leaves by HPLC-DAD
Tae Jung Kim[1], Jin Hyeok Kim[1], Young Ho Kim[1], Cheong-Weon Cho[1], Chang-Seon Myung[1], Seok Jin Kim[2], Hyun So Cho[2], Min Ho Yoon[3], Kyung Tae Kim[1], Jong Seong Kang[1]*
[1]College of Pharmacy, Chungnam National University, Daejeon 34134, Korea
[2]MSC Annexed Food Technology Research Institue, Yangsan 50518, Korea
[3]Department of Bio Environment Chemistry, Chungnam National University, Daejeon 34134, Korea

PT-062 Raman spectroscopic study of rice aging
Ukjae Lee[1], Sang-Hun Jeong[2], and Hyungbin Son[1]*
[1]Department of Integrative Engineering, Chung-Ang University, Seoul 06974, Korea
[2]Gwangju Center, Korea Basic Science Institute (KBSI), Gwangju 61186, Korea

PT-063 Liquid extraction surface analysis coupled with micellar electrokinetic chromatography of neutral pesticides on solid surface
Sun Kyung Jeong and Doo Soo Chung*
Department of Chemistry, Seoul National University, Seoul 08826, Korea

PT-064 Size-based fractionation of starch granules using split flow thin cell (SPLITT) and size-characterization by gravitational field-flow fractionation (GrFFF)
In Kang[1], Catalina Sandra Fuentes Zenteno[2], Jaeyeong Choi[1], Mauricio Penarrieta[3], Lars Nilsson[2],
Seungho Lee[1,*]
[1]Department of Chemistry, Hannam University, Daejeon 34054, Korea
[2]Department of Food Technology, Engineering and Nutrition, Lund University
[3]Food Chemistry Group, Carrera de Ciencias Quimicas, Facultad Ciencias Puras y Naturales, Universidad Mayor San Andres, Bolivia

PT-065 Studies of analysis on halophytes for the west-south coast in korea
Lee seil-bi, Kim na-yeon, Lee yong-hwa, Yi yong-sub*
Department of cosmetic science, Hoseo University, Asan city, Chungnam, Korea

PT-066 Accurate screening of 154 multi-class illegal adulterants in dietary supplements based on high-resolution extracted common ion chromatogram and neutral loss scan by UHPLC-Q/TOF-MS
Jisu Hur, Nam-Yong Ki, Na-Hyun Park, Wonwoong Lee, Jongki Hong*
College of Pharmacy, Kyung Hee University, 26 Kyunghee-daero,
Dongdaemun-gu, Seoul 02447, Korea

환경: PT 067 ~ 122

PT-067 Current status of antibiotics residues in ground flatfish farms of Jeju province
Mi-Kyoung Lee, Min-Kyu Choi, Jeong-Bae Kim, In-Seok Lee*
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PT-068 Concentrations and compositions of polycyclic aromatic hydrocarbons in sediments and organisms from the densed coastal aquaculture farms in South Korea
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PT-069 PBDEs and methoxylated-BDEs in antarctic toothfish (Dissostichus mawsoni): with comparison to the coastal seafood from Korea
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PT-070 Levels and distribution of PCDD/Fs and DL-PCBs sediment and organisms from the coastal aquaculture farms of Korea
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PT-071 Levels and compositions of perfluorinated chemicals in muscle tissues of antarctic toothfish (Dissostichus mawsoni)
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PT-072 Hygroscopic properties of size-segregated aerosol particles in Seoul and Daejeon, Korea during early-summer and winter, respectively
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PT-073 Chemical characteristics of size-segregated atmospheric aerosols in Seoul and Daejeon, Korea during early summer and winter, respectively
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PT-074 A study on the quantitative analysis of chloride in various fuel materials
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PT-075 Study on characters of asbestos on the suface of asbestos building materials and performance evaluation of asbestos scattering inhibitor
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PT-076 Development and application of reference material for otolith micro-analysis using LA-ICP-MS
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PT-077 Optimization of analysis method on recycled Vanadium(V) oxide from urban mine
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PT-078 Analysis and comparison of the volatile organic compounds between the cigarette smoke condensate (CSC) and extract (CSE) samples
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PT-079 Concentration variation of volatile organic compounds by light exposure when gaseous sample collection using PVF tedlar bag
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PT-080 Biomonitoring of environmental phenolic compounds in the South Korean adult's urine
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PT-081 Strategies for improvement of air quality in subway stations

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PT-082 Evaluation of recovery yields and uncertainties for bulk analysis of uranium and plutonium isotopes at ultra-trace levels by using MC-ICP-MS

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PT-083 Comparison of various acid digestion methods for the determination of metals in several coal combustion residuals

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PT-084 Identification of pollutants in water using oxygen and nitrogen stable isotope ratio

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PT-085 Pesticides (Diazinon and Parathion) of proficiency testing in drinking water

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PT-086 Monitoring water quality conditions for drinking water treatment units in 17 cities of taiwan

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PT-087 A method siloxane analysis in clean room using thermal desorption gas chromatography mass spectrometer

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PT-088 Preparation and characterization of silver-complexed polymeric automobile cabin filter

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PT-089 Development and Characterization of metal complexed air filter with carbon material

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PT-090 Elemental concentrations of uncertified trace elements in SLRS-6

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PT-091 A colorimetric probe to determine NO_2^- using label-free gold nanocrystals

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PT-092 A development of passive sampling technique for gaseous mercury

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PT-093 Dry deposition flux of gaseous oxidized mercury(GOM) and particulate bound mercury(PBM)

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PT-094 Determination of phenols in water using GC-MS following acetylation and liquid-liquid extraction

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PT-095 Quantitative determination of phenols in fish tissues using GC/MS following solvent extraction and acetylation

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PT-096 Nationwide concentration distributions of N-nitrosamines and secondary amines in chlorinated drinking water

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PT-097 Development of an improved method for determination of N-nitrosamines in drinking water using HPLC-FLD

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PT-098 Synthesis and application of Sm_2O_3 nanoparticles as a tracer for environmental contamination source

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PT-099 Chemical compositions of atmospheric aerosols in relation to meteorological phenomena at Gosan Site, Jeju Island

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PT-100 Development of DNA-based assessing method for mold in dust of dwellings, Korea

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PT-101 Identifying for the leaching characteristics of heavy metals from Ferronickel Slag(FNS)

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Kiheon Kim and Sun-Kyoung Shin
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PT-102 Occurrence of DDTs and PCBs in the eggs of black-tailed gulls (Larus crassirostris) inhabiting different Korean coastal ecosystems

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PT-103 Environmental behavior of hexabromocyclododecane in Korean and Japanese rivers

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PT-104 Mercury containing solid waste analysis using direct mercury analyzer

Na-Hyeon Cho, Dong-Gun Hwang, Woo-il Kim, Jin-Mo Yeon, and Kiheon Kim, Sun-Kyoung Shin*
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PT-105 Flammability analysis of spent organic solvents

Na-Hyeon Cho, Dong-Gun Hwang, Kiheon Kim, Sun-kyoung Shin*
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PT-106 A study on guideline for effective operation and safety management of air dome-typed landfill facilities

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PT-107 Monitoring surveys for heavy metal from ordinary portland cement

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PT-108 A study on possibility to thermal treatment for SCCPs and OCPs containing waste.

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PT-109 Emission characteristics of PCDDs/DFs from medical waste incinerators

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PT-110 Collection of atmospheric gaseous mercury for stable isotope analysis

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PT-111 The variation of magnesium isotopic composition in carbonates by diagenesis process

Sin-Woo Lee[1], Min-Seob Kim[1], Gong Soo Chung[2], Jong-Sik Ryu[3], Kang-Sik Lee[3], Hyen-Mi Chung[4]
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PT-112 Analytical methods for hexabromocyclododecanes in comsumer products

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PT-113 Separation characteristics of perfluorinated compounds in different cartridge types using LC-MS/MS

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PT-114 Improvement of organochlorine pesticides analysis method using tandem cleanup method

Gang-San Lee, Sang-min Kim, Il-Gyu Kim, Young-Sun Do, In-Young Chung* and Kwang-Seol Seok
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PT-115 Characterization of the background content of Mn and Se in selected groundwater considering geology in south korea

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PT-116 Analyzing the cell toxicity caused by cetylpyridinium chloride

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PT-117 Cytotoxicity and inhibition cell growth assessment in lung epithelial cell A549 of cinnamaldehyde

Eum-Ji Kim*, Jean Yoo, Yeon-Mi Lim, Hawon Kim, Hyun-Mi Kim, Il-Seob Sim, Pilje Kim, Seung Do Yu
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PT-118 The effects of cetyltrimethylammonium bromide on cellular toxicity of human alveolar epithelial cell line, A549

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PT-119 Water quality trend after introducing the plan of total maximum daily loads in the nakdong river watershed

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PT-120 Analysis of nonpoint sources runoff patterns in korean orchards

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PT-121 Characteristics of nonpoint source pollution in korean roads

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PT-122 Contribution ratio of VOCs emmitted from sanitary pad's Material using the micro scale chamber

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PT-123 Determination of urea in serum by IDMS and the change of certified value according to storage temperature
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PT-124 A study on the standardization of test method for TCEP
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PT-125 Development reference materials for analysis of RoHS 2 candidates
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PT-126 Screening of anabolic androgenic steroids in equine urine couple with gas chromatography-tandem mass spectrometry
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PT-127 A study on the effect of blood identification and DNA extraction with urine test strips by alcohols
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PT-128 Improved development of the aged latent fingerprints with Sodium lactate in silica gel powder treatment before cyanoacrylate fuming: A preliminary study
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PT-129 A study on the effectiveness of fingerprint lifting from diverse surfaces
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PT-130 Determination of β-hydroxybutyric acid in postmortem muscle samples by ultra-high performance liquid chromatography-tandem mass spectrometry
Hyun Kyoung Ju[1*], Ah Ram Choi[1], Sang Chul Huh[1], Seung Jin Ryu[1], Jin Mee Jung[1], Kyoung-Min Kim[1], Su Hyeon Lee[1], Jong Sin Park[1], Jae Gyun Kim[1]
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PT-131 Quantitative analysis of dyed fiber using raman microspectroscopy in forensic science
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PT-132 New identification method of stamping ink using DNA
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PT-133 Case report on the scientific analysis of forged artwork
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PT-134 Differentiation of printing paper using stable isotope ratio mass spectrometry
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PT-135 An interrelation of blood alcohol concentration with breath alcohol concentration from a field test in Republic of Korea drinking drivers
Young-Hoon Jo, Hye-Jin Choi, Keun-Young Park, Se-Jin Oh, Nam Yee Kim, Mi-A Kwon*
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PT-136 Evaluation study of three commercial STR kits to establish stochastic threshold
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PT-137 Mixture study of globalFiler PCR amplification kit
Ju Yeon Jung, Gang Nam Jin, Seo Hyun Moon, Nam Ye Kim, Won Hae Lee, Jang Yong Kim, Si-Keun Lim, Yang Han Lee, and Jung Ho Hwang*
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PT-138 Stability evaluation of national biological reference standards in Korea
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PT-139 Determination of 21 tar colors in lipsticks by liquid chromatography/tandem mass spectrometry
Jun Hyung Kim, Gihaeng Kang, Ayoung Min, Ji Hyun Lee, Hyoung-Joon Park, Taeik Hwang, Seok Heo, Jeong-Hwa Cho, Dong Woo Shin, Seongsoo Park, Sung-Kwan Park and Hoil Kang*
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PT-140 Identification of a new tadalafil analogue in commercial dietary supplements: isopropylnortadalafil
Ji Hyun Lee[1], Han Na Park[1], Hyoung Joon Park[1], Nam Sook Kim[1], Aeran Jung[1], Sung Kwan Park[1], Seong Soo Park[1], Hoil Kang[1*], Jong Kook Lee[2*]
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PT-141 Simultaneous analysis for determination of sedative-hypnotics and sleep inducers in adulterated products by quadrupole-orbitrap-MS and UHPLC-MS/MS
Ji Hyun Lee[1], Han Na Park[1], Nam Sook Kim[1], Hyoung Joon Park[1], Ji Hyun Paek[1], Seong Soo Park[1], Sung Kwan Park[1], Seok Heo[1], Taeil Hwang[1], Jeong Hwa Cho[1], Joon Hyoung Kim[1], Dong Woo Shin[1], Hoil Kang[1*]
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PT-142 Metabolic profile determination of 24N-NBOMe by human liver microsomes using LC-TOF-MS

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PT-143 Simultaneous determination of 19 new psycoactive substances in human plasma for quantitative analysis with LC-MS/MS

Sun-hwa Bong, Hyewon Seo, Hye Jin Cha, Jisoon Shin, Young-Hoon Kim, Hye-Kyung Park, Hyung Soo Kim and Jin Hong*

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PT-144 Improvement of enantiomeric purity method for clopidogrel bisulfate in korean pharmacopoeia

Sun-hee Kim, Hana Song, Soo Jin Park, Kwang Moon Lee and Won Shin[*]

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PT-145 Analytical method development of enantiomeric purity for tamsulosine hydrochloride in korean pharmacopoeia

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PT-146 Thermogravimetry(TG), as an alternative test method for volatile impurity test of reference standard

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PT-147 Development of the analytical method of ethanol with GC/FID using capillary column for the purity test of dexamethasone phosphate disodium in korean pharmacopoeia

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PT-148 Development and validation of high-performance liquid chromatographic method for common assay of cefbuperazone sodium for injection and cefbuperazone sodium in Korean Pharmacopoeia

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PT-149 LC-MS based profiling and inhibits melanogenesis activation from Rhizoma Arisaematis

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PT-150 Application of AMS for PK and brain distribution of C-14 taurine related to dementia

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PT-151 The study on distribution of ^{14}C thymidine labeled mesenchymal stem cells in vivo using accelerator mass spectrometry

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PT-152 Analysis of 13β-Ethyl-3-methoxy-gona-2,5(10)-diene-17-one and its metabolites after oral administration by LC/MS and GC/MS

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PT-153 Study on effect of particle size and content of mica on sun protection factor (SPF) using gravitational field-flow fractionation (GrFFF) and dynamic light scattering (DLS)

Ji Hye Kim[1], Jeong Hoon Jin[2], Woo Jin Jeon[2], Ji Hoon Baek[2], Ji Woo Hwang[2], Ki Han Cho[2], Jaeyeong Choi[1], and Seungho Lee[1,*]
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PT-154 Non-targeted metabolic profiling analysis for diagnosis of internet/smartphone addiction disorder

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PT-155 Simple and sensitive assay for quantification of oseltamivir phosphate(Tamiflu®) in human plasma using by LC-MS/MS: Application in bioequivalence study

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PT-156 Anti-microbial activity of silver fabrics

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PT-157 HPLC method development for the photo-stability test of diphencyprone (DPCP) and its dispensary medication

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PT-158 Development of an HPLC-UV method for the quantification of phenolic compounds in Orostachys japonicus

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PT-159 Development of high performance liquid chromatography assay method of tramadol hydrochloride injection

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PT-160 An HPLC method for the determination of thioctic acid in raw material and tablets

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PT-161 Characteristic analysis to the surface of stainless steel coated Au(III)-plated

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PT-162 Significance test of limestone certified reference material

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PT-163 Study on evaluation of thermal conductivity characteristics of isolation-heat paint

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PT-164 Adsorption of metal ions using the membrane of vertically aligned carbon nanotube

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PT-165 Optimization of analysis method for trace elements in tantalite ore by ICP-OES

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PT-166 A study on wet chemical analysis, ICP-AES, XRF determination of major elements in clay minerals and their characterization

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PT-167 Surface characterization of porous nanomaterials in environmental applications

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PT-168 An experimental study of material characteristics of lime mortars used for Namhansanseong Yeojang

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PT-169 Determination of platinum group elements using fire assay

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PT-170 Determination of decomposition intermediates of oxime-based extractants

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PT-171 Comparative analysis of trace elements in clay minerals by ICP-OES, ICP/MS

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PT-172 The metal-fe disintegration and analysis method used $HgCl_2$

Jang-Keun Park, Eui-Chang Hwang, Young-Jin Seo, Eun Jin Lee, Hyung-Sam Kim
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PT-173 Research and development of eco-friendly mineral engine oil
In Jae Lee[1], Bomin Kim[1], Woonjung Kim[2], Byungjoon Kim[2], Min Gi Kim[2], Dong Yeong Kim[2], Chul Kim[2]*
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PT-174 Determination of silicon in biodiesel by ICP-AES
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PT-175 Study on fracture of automobile clutch diaphagm in spring steel
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PT-176 Clamping process for delayed fracture mechanism of ear-type band
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PT-177 Study on the determination of boron in cathode active material of lithium ion battery by ICP-MS
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PT-178 Optimization of GD-MS analysis according to Cu specimen type
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PT-179 Study of analysis for oxide powder by glow discharge mass spectrometer
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PT-180 Development and analysis of environmentally friendly cleaning agent
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PT-181 Dispersion and characterization of environmentally friendly water soluble lycopene pigment particles
Jihyun Bae, Jongjin Jung, Seungho Lee and Woonjung Kim*
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PT-182 Development and characterization of environment-friendly flavoring agent
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PT-183 Synthesis and characterization of ceria nanoparticle dispersant
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PT-184 Study on the stability of abrasive ceria nanoparticle slurry
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PT-185 Development and characterization of high efficiency fine dust filter
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PT-186 Development of commonly applicable HPLC assay for raw materials and finished product of Rifampicin in KP 11
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PT-187 Introduction to analytical method of zinc and calcium isotope using multi-collector ICP/MS
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PT-188 Property of cations and isotopes of national groundwater monitoring wells
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PT-189 REE extraction methods in organic matter in river and marine sediments
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PT-190 Lead isotope analysis using a MC-ICPMS
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PT-191 Determination of trace metals and rare earth elements in seawater using flow injection-Triple quadrupole ICP MS
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PT-192 Determination of Arsenic and Selenium with mass shift mode by triple quadrupole ICP-MS
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PT-193 Case study on identification of mono-substituent organic substance
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PT-194 Study on the analysis of formaldehyde in textile products by comparison of DNPH and nash method
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PT-195 Review on the process for substance identification and generating substance identity profile (SIP) based on REACH
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PT-196 Colorimetric dual sensor of Fe^{3+} and Hg^{2+} ions based on sequential detection by etching and aggregation of gold nanorods

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PT-197 Determination of metabolic pathway using ^{13}C-labeled microbial products by GC/TOF-MS

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PT-198 Development of an radioanalytical method for artificial radionuclide in seafood stuffs

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PT-199 Simultaneous quantitative and qualitative analysis of Mono-, Di- and Tri-saccharides using ^{13}C Q-NMR in standardless conditions

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PT-200 Evaluation of process blank in chemical separation for analysis of individual uranium particle by MC-ICP-MS

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PT-201 Determination of $^{143}Nd/^{144}Nd$ isotope ratio in environmental Samples by MC-ICP-MS

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PT-202 Observation of sn-interferences on the uranium isotope analysis using secondary ion mass spectrometry (SIMS)

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PT-203 A study on the determination of hydrocarbon dew point of natural gas

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PT-204 A study on the establishment of the analytical technology for heavier hydrocarbons(C7+) in natural gas

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PT-205 The screening and identification of melee size diamond using advanced methods

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PT-206 A study of the peel & shear strength on accelerated weathering paints by SAICAS

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PT-207 Structure and hydrogen bonding characterization of sag control agent (SCA) using NMR spectroscopy

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PT-208 Structural analysis of the hair cosmetics on hair surface using x-ray photoelectron spectroscopy with gas cluster ion beam (GCIB) source

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PT-209 A study of inorganic ion analysis in the organic matrix

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PT-210 Contamination cleaning of TEM samples (Formvar Grid) with halogen lamp

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PT-211 Fragment analysis of triazine compound using mass spectrometer

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PT-212 Analysis of organic multiple layers using GCIB ToF-SIMS

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PT-213 Effect of light on size of chlorella sorokiniana and production of glutathione using gravitational field-flow fractionation (GrFFF) and related techniques

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PT-214 Study on effect of composition of salt and temperature on oligomerization of glutamate decarboxylase using asymmetrical flow field-flow fractionation (AF4) and light scattering

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PT-215 Application of thermal field-flow fractionation coupled with multi-angle light scattering (ThFFF-MALS) and size-exclusion chromatography (SEC) for characterization of synthetic rubber (SR)

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PT-216 Anion-exchange membrane with PVC-g-PBVBIC prepared by SARA-ATRP and their application as separator in vanadium redox flow battery

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PT-217 Preparation of anion-exchange membrane based on PS-b-PVEPI for vanadium redox flow battery

Hyeong-Chan Choi and Seong-Ho Choi*
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PT-218 Determination of Na^+ and K^+ cation in human urine by QCM ionic sensor

Min-Hee Kim and Seong-Ho Choi*
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PT-219 Development of CdSe sensitized solar cell using the polyphenylene and polythiophene conducting polymer as electron transfer mediator
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PT-220 Preparation and evaluation of enzymatic biosensor with polythiophene conducting polymers as electron-transfer layer
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PT-221 A fluorescence study of flip-flop rate of lipid molecules in lipid vesicles
JinJu Jeong, Minki Kim, Chul Kim
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PT-222 The Development of SBVI polymer-conjugated siRNA Delivery System
Soojin Jang, Hakjun Do, Seongho Choi, Jongjin Jung*
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PT-223 Changes in shape and stability of liposomes with changes in osmotic pressure
Jieun Sim, Seungeon Yeon, Minwook Kim, Woonjung Kim, Jaeyoung Choi, Seungho Lee, Jongjin Jung*
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PT-224 Development of the detection of microorganism from the natural dye materials
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PT-225 Development of target-specific cell imaging probe using fluorescent nanoparticle coated with serum proteins and conjugated with antibody
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PT-226 The synthesis of high performance non-toxic $(Zn_xAg_yIn_z)S_2$ nanocrystal using ultrasonication
ChanWoo Park[1], Hyeon Jeong Seo[1], SoonHee Seol[1], Joung Kyu Park[2], and Jongjin Jung[1*]
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PT-227 Study of oxidation stability enhancement of natural dye henna
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PT-228 Study of cellular behaviors on hydrophobic PDMS (poly dimethylsiloxane) nano-brush by tracking FA complexes using BSA-coated ZAIS nanoparticle probe
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PT-229 Supersensitive plasmonic single nanoparticle-based cancer antigen 125 immunodetection by dual-mode wavelength-dependent enhanced dark-field microscopy
Soyeong Ju[1], Suresh Kumar Chakkarapani[1], Seungah Lee[1] and Seong Ho Kang[1,2,*]
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PT-230 Simultaneous detection of thyroid hormones by immunoreaction-based dual-wavelength capillary electrophoresis
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PT-231 Quantitation analysis of selenium metabolites in sample in vivo by HPLC-inductively coupled Plasma-MS
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PT-232 Separation and analysis of Se species from various human samples using HPLC-ICPMS
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PT-233 Synthesis and characterization of zinc ion imprinted polymer
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PT-234 A study on activated magnetic hydrochar from coffee sludge as a selective adsorbent for 2,4-Dichlorophenoxyacetic acid
Nayeon Shim, Hyeyoung Jung, Sunyoung Bae*
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PT-235 Analysis of optimized chemically defined minimal media for sweet protein brazzein industrial scale expression in *Kluyveromyces lactis*
Hyeong-Min Lee, Hye-won Choi and Kwang-Hoon Kong*
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PT-236 Quantitative assay of secretory expressed sweet protein brazzein in Kluyvermyces lactis with complex media
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PT-237 Synthesis of (R)-Phenylglycinol 1-adamantanecarbonyl derived chiral stationary phase and application
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PT-238 Synthesis of (S)-Tryptophanol and (R,R)-Threoninol derived chiral stationary phases and application
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PT-239 New and innovative additives for use in reclaimed asphalt pavements
Jiwung Kim, Haksoo Lee, Nader Nciri, Taesub Shin, Namjun Cho[*]
Department of Energy·Materials·Chemical Engineering, Korea University of Technology and Education, Cheonan 31253, Korea

PT-240 An analysis of physicochemical properties of petroleum and natural asphalts
Nader Nciri, Taesub Shin, Jiwung Kim, Haksoo Lee and Namjun Cho*
Department of Energy, Materials and Chemical, Korea University of Technology and Education, Cheonan 31253, Korea

PT-241 Hyperpolarized silicon nanoparticles as biocompatible imaging agents for magnetic resonance imaging
Hyeonglim Seo, Youngbok Lee*
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PT-242 Synthesis and characterization of graphene-enfolded TiO_2 anatase as anode materials for Li-Secondary batteries
Hasan jamal[1], Byung-Seon kang, Hochun lee, Jong-Sung yu, Chang-Seop lee[1*]
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PT-243 Simultaneous determination of residual pesticide in tea using dispersive liquid-liquid microextraction(DLLME) and HPLC-UV
Seung-Ho Lee, Jong-Sung No, Hyun-Woo Cho and Seung-Woon Myung[*]
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PT-244 Deionized water recycle system for reagent free ion chromatography
Gahyeon Lee[1*], Jiwon Eom[1], Dong Soo Lee[1], Minhye Joung
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PT-245 ^{1}H-NMR based metabolomic studies of VHSV infected olive flounder
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and Suhkmann Kim*
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PT-246 Headspace in-tube microextraction (HS-ITME) of dichlorophenols using a commercial capillary electrophoresis instrument
Yun Jung Choi[1], Doo Soo Chung[1]*
[1]Seoul National University, Department of Chemistry, Seoul, 08826, Korea

PT-247 Headspace in-tube microextraction for analysis of volatile compounds by capillary electrophoresis mass spectrometry
Joon Yub Kwon, and Doo Soo Chung*
Bioanalytical Chemistry Laboratory, Department of Chemistry, Seoul National University, Seoul 08826, Korea

PT-248 Concentration of natural radioactive materials by grain size
Sunghyen Cho[1], Jeong-ki Yoon[2], Mo Sung Lee[3*], In Sang Choi[3]
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PT-249 Cross talk eliminated six-color detection of single cell imaging; application to monitoring obesity-induced insulin resistance in adipocyte and HepG2 cell co-culture
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PT-250 Synthesis and monitoring of high-valence silver propamidine nanoparticles for diabetic foot ulcer treatment
Jinran Lee, Joon Myong Song*
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PT-251 Pin point analysis method using primary ion beam alignment
Junhyoung Lee
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PT-252 Determination of traces of organic additives in traditional lime mortars: A preliminary study
Soyeong Kang*, Eun-Kyung Kim, Sunah Ahn, Byeong Jik Nam and Sang-Eun Kim
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Symposium Ⅰ

-법과학/안전-

SP Ⅰ-1

Simple synthesis and analysis of triacetone triperoxide (TATP): identification by NMR and UPLC-ESI-TOF-MS and comparative assessment of reaction yield through chemical precursors

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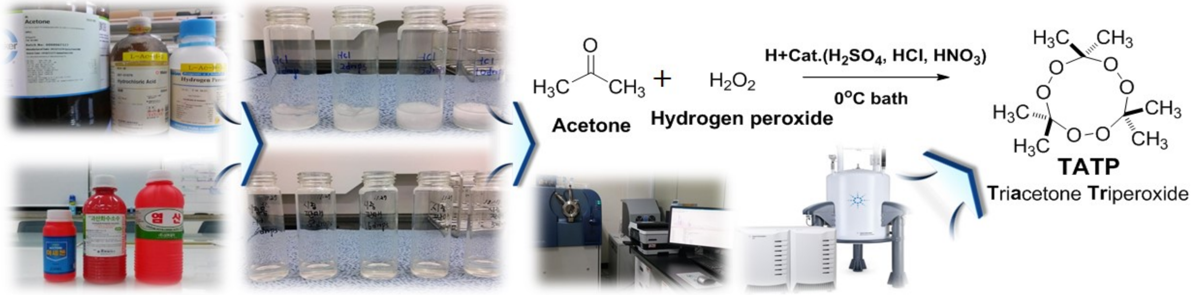
Triacetone triperoxide (TATP, $C_9H_{20}O_9$), an organic peroxide is a potent explosive compound [1,2] and can be easily synthesized with available chemical precursors, including acetone, hydrogen peroxide and acid catalyst [1,3]. This material has increasingly attracted an improvised explosive source widely used in the terrorism of late. In the present work, we demonstrated the structure of target molecule through simple synthesis by NMR spectroscopy, UPLC-ESI-TOF-MS ($[M+H]^+ = 223.1183$), and FT-IR [1,3,4,5]. Moreover, our research has evaluated for the first time the reaction yields of TATP between laboratory reagents and commercial life materials from several conditions. The TATP yields using laboratory reagents (acetone: 100%, H_2O_2: 28%, HCl: 35%, HNO_3: 70%, and H_2SO_4: 95%) were observed considerable differences in the ranger of 5.9−64.7% according to the sources (HCl, H_2SO_4, and HNO_3) and concentrations of acid catalyst. Interestingly, this compound showed high yields with increasing concentrations of acid catalysts. However, the products through the commercial materials of various manufactures (acetone: 100%, H_2O_2: 3 and 4.6%, and HCl: 9.9%) were not detected (< 0.001% yield) in various reaction conditions. In addition, TATP contents showed significant differences in hydrogen peroxide concentrations through reaction mixtures of laboratory and commercial sources, especially, its formation does not manufacture in the lower concentration than 14%. Based on the above results, we believe that TATP cannot be easily synthesized from the commercial sources such as acetone (100%), H_2O_2 (3 and 4.6%), and HCl (9.9%) in the local market.



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SP Ⅰ -2

The analysis of explosives for nationality or tracing origin by IRMS

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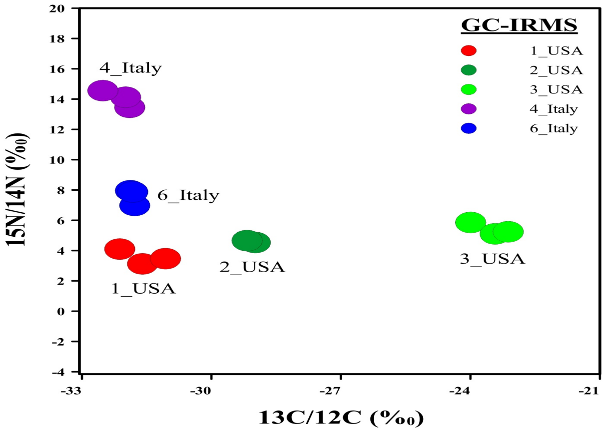
The explosive substances encountered in the forensic laboratory for not only analysis of components but also source tracing. We try to analyze explosives (nitroglycerin) for nationality or tracing origin by stable isotope ratio analysis and shots by elemental components analysis. Sometimes, the shotgun was used in any violent cases in our country. In this research, nine shotshells with made by four different countries for shotgun were analyzed their composition for source tracing. The shotshell consists of shot, wad, primer, and propellant. The propellant of the shotshell was analyzed by TLC, color test and gas chromatography mass spectrometry (GC/MS). The values of stable isotope ratio (δ^{13}C, δ^{14}N) for nitroglycerin of propellant in the shotshells were analyzed with Gas chromatography-continuous flow isotope ratio mass spectrometry (GC-IRMS). The elemental components of shots in the shotshells were analyzed with X-ray fluorescene spectroscopy (XRF). The result was that the five shotshells (four different brands) were detected nitroglycerine as explosive components (propellant) among nine shotshells. The five shotshells could be distinguished according to the values of stable isotope ratio for both δ^{13}C and δ^{14}N, completely. And the elemental compositions of shots have revealed significant compositional variability. The shotshells could be distinguished according to the relative amounts of the potassium (K), iron (Fe), cupper (Cu), and lead (Pb).



SP Ⅰ-3

New technologies in forensic DNA; Beyond STR

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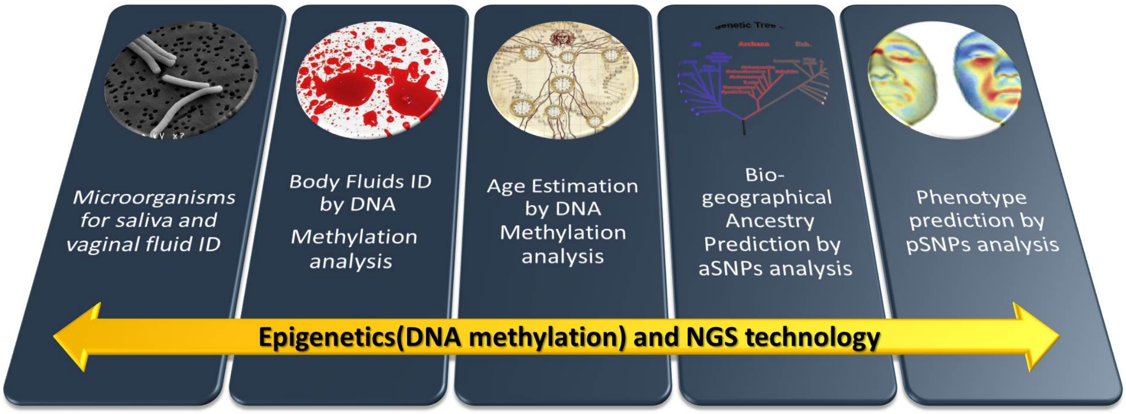
Forensic DNA analysis is changing dramatically these days. Forensic DNA database core markers are scheduled to increase from 13 to 20 within this year to reduce the probability of random match. The statute of limitation on homicide was removed in 2015, so re-investigation of hundreds of unsolved murder cases could be possible in Korea. Future technologies such as prediction of age and body fluids identification by DNA methylation analysis, prediction of bio-geographical ancestry and visible characteristics by analyzing SNPs, MPS(multiple parallel sequencing) and rapid DNA technologies are opening a new era in forensic DNA.



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SP Ⅰ-4

Solid indicators for acid or base spills at chemical accidents

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When chemical accidents happen, visualization of the accident area will be beneficial in many ways. The usage of neutralization agents can be carefully controlled only inside the visualized area. Well controlled polluted area and limited usage of neutralizing agents can give both environmental and economic benefits. The color change of the indicators provide the end point of the neutralization as well. It is much easier to see color changes on solids than those of liquid solutions in the field because liquid rapidly disappears into the soil. We have investigated the ways to prepare solid indicators for chemical accidents. Preparations of the indicators, observation of color change during neutralization, and durability of the materials will be discussed.

Symposium II

-화학/재료-

SPⅡ-1

Recent advances in mass spectrometry-based steroid profiling

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Although mass spectrometry (MS)-based steroid profiling has been applied for clinical and biochemical studies, the technical improvement for exact quantification of steroids in limited biological sample volumes is still needed. In contrast to the hydrophobic interaction solid-phase extraction (SPE), hybrid SPE-precipitation (H-PPT), supported liquid extraction (SLE) and silica nanoparticle (SNP)-based techniques could be comparatively assessed for isolation of steroid hormones from biological specimens followed by gas chromatography–mass spectrometry (GC-MS). Chemical derivatization has been used to overcome problems associated with low ionization, compound instability, and unacceptable chromatographic properties in liquid chromatography-mass spectrometry (LC-MS). Among endogenous steroids in human, major adrenal steroids, such as cortisol and aldosterone, are consisted in 3-keto-4-ene backbone, and also contained hydroxyl groups. To improve analytical properties in LC-MS-based profiling assay, newly synthesized aryl hydrazides were introduced for the protection of the 3-keto group combined with various techniques for hydroxyl groups. The resulting products as hydrazone steroids were interpreted with mass spectra and the advanced analytical sensitivity in steroid profiling was compared. In this presentation, two different analytical aspects listed above and pathophysiological application results will be introduced.

SPⅡ-2

Statistical approach of alkylphenol ethoxylates

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Alkylphenol ethoxylates (APEOs) are non-ionic surfactants which have a dispersing, wetting, emulsifying and washing properties, so these make APEOs suitable for a very large variety of applications. They have been widely used in textile, leather and pulp industry as detergents and as scouring, coating or waterproofing agents [1]. The production of APEOs is over 300,000 tons per year, of which about 80% are nonylphenol ethoxylates (NPEOs) and the remaining 20% are octylphenol ethoxylates (OPEOs) due to their detergent properties [2]. Typical NPEOs usually have monomers from 1 to 20 ethoxylate units and these are synthesized by adding excess ethylene oxide (EO) to 4-nonylphenols (4-NP). When APEOs are discharged in the form of wastewater, they have degraded in environment and this degradation shortens the ethoxylate chain and creates more hydrophobic metabolites such as nonylphenol (NP) or NP1EO to NP3EO [3-4]. Recent studies found that these metabolites are toxic to aquatic organism and environmental endocrine disruptors which cause reproduction problems. Due to toxicity of APEOs, EU and US EPA have already registered APEOs in harmful substances list [5-6]. In Korea, the use of NPEO and NP have been forbidden in household detergent and textile softener and additional restriction will be placed on infant and children textile products from 2018 year.
This study introduces new solution of screening analysis with statistical approach by comparing experimental mass and exact mass using Quadrupole-Orbitrap mass spectrometer.

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SPⅡ-3

Fabrication of microextraction needle with polymeric sorbents

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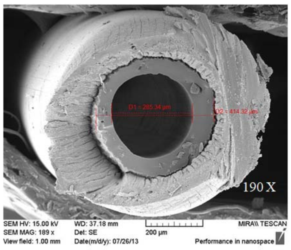
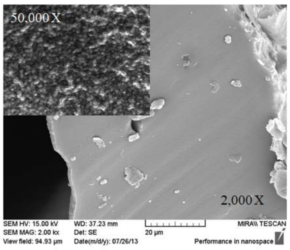
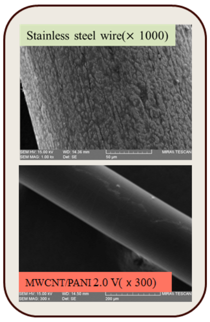
Sorbents have been used to remove organic/inorganic analytes such as atoms, ions, and molecules from different media. The removal mechanisms can be adsorption and/or absorption. Adsorption is a surface-based process while absorption involves the entire volumes of the sorbent. Specific material types of sorbents can be categorized as activated alumina, activated carbon, calcium sulfate, calcium oxide, clay and clay silicates, molecular sieve or zeolites, organic polymers, and silica gel. In particular, organic polymers are chains of repeating carbon based molecules used as adsorbents in size-exclusion chromatography and gas separation processes with high retention power and selectivity. Sorbents can be artificially manufactured or naturally occurred.

In our laboratory, a needle for microextraction has been fabrication with a sorbent to extract the target analytes from the headspace of the sample. The polymeric sorbents synthesized in our lab include PDMS-based polymers via sol-gel process and aniline-based polymers via electrochemical process. The sorbents were coated inside of the needle or on the surface of the wire which was inserted into the needle for extraction. The advantage of coating sorbent inside the needle would be easy to handle because it was not exposed to the environment.. The polydimethylsiloxane was mixed with additives such as polyacrylic acid, ß-cyclodextrin, polystyrene resin cross-inked with 1% divinylbenzene, polyethylene glycol, polyvinyl alcohol, and many more using a sol-gel technique. Polyaniline with (without) multi-walled carbon nanotube was electronically polymerized directly on the wall of the needle using cyclic voltammetry. The synthesized sorbents were characterized for physicochemical properties measured by the Fourier-transform Infrared spectrometry, scanning electron microscopy (SEM), atomic force microscopy (AFM) were applied.

Extraction method consists of the process including sorbent synthesis, sorption, and desorption. All conditions were optimized specifically for the target analytes. The proposed method has been validated with respect to limit of detection, limit of quantitation, dynamic range, reproducibility, accuracy, and recovery. As a result, the sorbents with different distribution coefficient to enhance the extraction have been synthesized and investigated successfully. The fabricated microextraction needle with polymeric sorbents has been applied to the headspace samples.







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SPⅡ-4

Augmented fluorescence-free 3D super-resolution microscopy using enhanced dark-field illumination based on wavelength-modulation and a least-cubic algorithm

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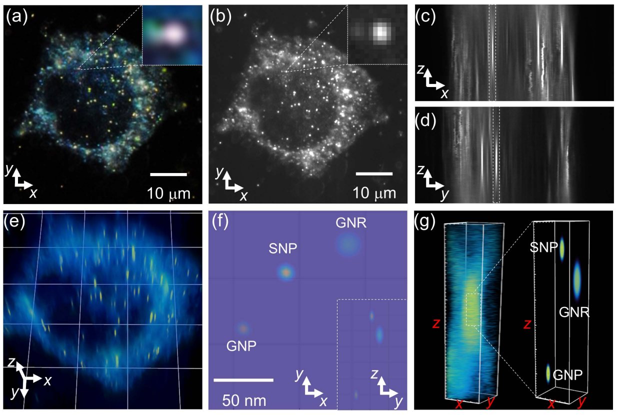
Three-dimensional (3D) super-resolution imaging of fluorescence-free plasmonic nanoparticles (NPs) was achieved using enhanced dark-field (EDF) illumination based on wavelength-modulation and a least-cubic algorithm [1-5]. Various plasmonic nanoparticles on a glass slide (i.e., gold nanoparticles, GNPs; silver nanoparticles, SNPs; and gold nanorods, GNRs) were imaged and sliced in the *z*-direction to a thickness of 10 nm. The coordinates (*x*, *y*) of each NP were resolved by fitting their point spread functions with a two-dimensional (2D) Gaussian. The measured localization precisions of GNPs, GNRs, and SNPs were 2.5 nm, 5.0 nm, and 2.9 nm, respectively. The 3D coordinates of individual GNP, SNP, and GNR (*x*, *y*, *z*) were resolved by fitting the data with 3D point spread functions using a least-cubic algorithm and collation. Final, 3D super-resolution microscopy (SRM) images were obtained by resolving 3D coordinates and their Cramér-Rao lower bound-based localization precisions in an image space (530 nm × 530 nm × 300 nm) with a specific voxel size (2.5 nm × 2.5 nm × 5 nm). The least-cubic method was more useful for finding the center in asymmetric cases (i.e., nanorods) with high precision and accuracy compared with the commonly used least-square method. This 3D fluorescence-free SRM technique was successfully applied to resolve the positions of various nanoparticles in a living single cell with subdiffraction limited resolution in 3D.



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Symposium III

-표준/원자력-

SPⅢ-1

Reliability of chemical measurement

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Metrology, the science of measurement, provides measurement scientist including analytical chemists with worldwide accepted guidance for the reliable measurement results [1, 2, 3]. Based on the guidance, the necessary and sufficient conditions for the reliable chemical measurement are discussed.

“Measurement starts with metrological traceability
and ends with measurement uncertainty.”

Metrological traceability has something to do with the scientific authority of the measurement result. Then, to what base is the authority of the result traceable? Moreover, traceability should be conceived and established before the measurement is even started. Measurement uncertainty is not the same as measurement repeatability and reproducibility. Uncertainty is the measure of the reliability of the measurement result.

무늬만 측정 이제는 끝!!

“음주

! 무늬만 측정? 이젠 끝

大法, 운전자에 무죄선고

경찰의 음주측정기 측정 결과는 면허를 취소하거나 벌금을 부과하는 확실한 근거가 되지 못한다는 대법원 판결이 나왔다.

이에 따라 경찰과 검찰이 음주측정기 측정 결과를 면허취소나 형사처벌 자료로 사용하기 위해서는 객관적인 측정 방법을 마련해야 한다.

대법원 2부(주심 이강국 대법관)는 경찰 음주측정 결과 혈중알코올농도 0.058% 상태에서 운전한 혐의로 기소된 유 모씨에게 무죄를 선고했다고 17일 밝혔다.

군인인 유씨는 2004년 8월 강원도 철원군 도로를 1.5㎞가량 운전하다 군·경 합동 음주단속에 걸렸다. 5번 측정해 최저 0.058%에서 최고 0.079%까지 나왔다.

검찰은 가장 낮은 수치를 적용하더라도 면허정지 기준인 혈중알코올농도 0.05% 이상이라며 유씨를 기소해 1심에서 벌금 600만원이 선고됐다.

대법원은 다르게 판단했다. 대법원은 판결문에서 "경찰 음주측정 결과는 운전면허 정지나 취소, 그리고 이후 수사와 재판의 중요한 자료로 사용되기 때문에 정확성과 객관성이 담보되는 공정한 방법과 절차에 따라 이뤄져야 한다"고 전제했다.

재판부는 "유씨의 경우 음주측정용 불대를 바꾸지 않은 채 5분 새 5번 음주 여부를 측정했고 결과도 0.021%포인트나 차이가 났다"며 "상황이 이렇다면 경찰은 음주측정기에 문제가 있는 것은 아닌지, 측정 방법에 문제가 있지는 않았는지 검토하고 제대로 측정해야 했다"고 설명했다.

재판부 관계자는 "경찰 단속 지침에는 음주 후 20분이 지나지 않은 때는 입 안 알코올농도가 혈중농도보다 높을 수 있어 음주측정을 하지 못하도록 돼 있다"며 "그 밖에도 운전자 입 안에 술기운이 남아 있을 가능성에 대비해 측정 전에 생수로 입을 헹구게 하는 등의 조치가 필요하다"고 설명했다. 이 관계자는 그러나 "대법원 판결은 경찰의 모든 측정 결과를 부인하는 것은 아니지만 객관적인 근거 없이 측정기 수치만으로 면허취소나 벌금 부과를 할 수 없다는 취지"라며 "경찰이 하루빨리 과학적 근거에 바탕한 기준을 마련해 제시해야만 잇따르는 소송을 막을 수 있을 것"이라고 말했다.

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SPⅢ-2

Gas analysis and international comparisons

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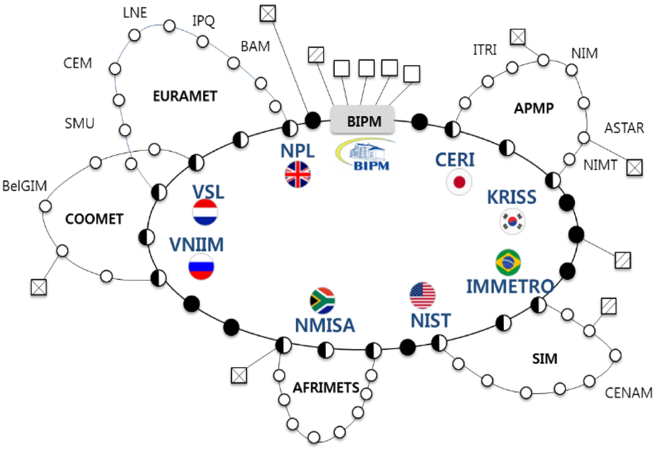
General Conference of Weights and Measures Mutual Recognition Arrangement (CIPM MRA) is an agreement between national metrology institutes (NMIs), responding to the need for an open, transparent and comprehensive scheme to give users reliable quantitative information on the comparability of national metrology services and to provide the technical basis for wider agreements negotiated for international trade, commerce and regulatory affairs [1]. The objective of the CIPM RMA are to establish the degree of equivalence of national measurement standards and to provide for the mutual recognition of calibration and measurement certificates issued by participating institutes [2]. To reach the objectives, the participating NMIs and designated institutes (DIs) should participate in international comparisons of measurement standards, and their declared Calibration and Measurement Capabilities (CMCs) and quality systems should be peer reviewed with demonstrations of their measurement competence [2]. International comparison is one of key components to demonstrate NMIs and DIs measurement capabilities within the CIPM MRA. Gas metrology (or gas analysis) is a part of chemical metrology which consists of organic, inorganic, electrochemical, and biological (cell, nucleic acid, and protein), and surface analysis. In gas analysis working group, international comparisons are conducted to assess analytical and preparative capabilities of primary gas standards of participating NMIs and DIs. This study describes about how results from international comparisons in gas analysis is connected with national, industrial, and regulatory gas standards and introduce CMCs in gas analysis reported by KRISS.



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[2] EURAMET, Metrology – in short 3rd edition (2008) p31.

SPⅢ-3

Study on CCl_4 alternative solvent for performance evaluation of permeability protection

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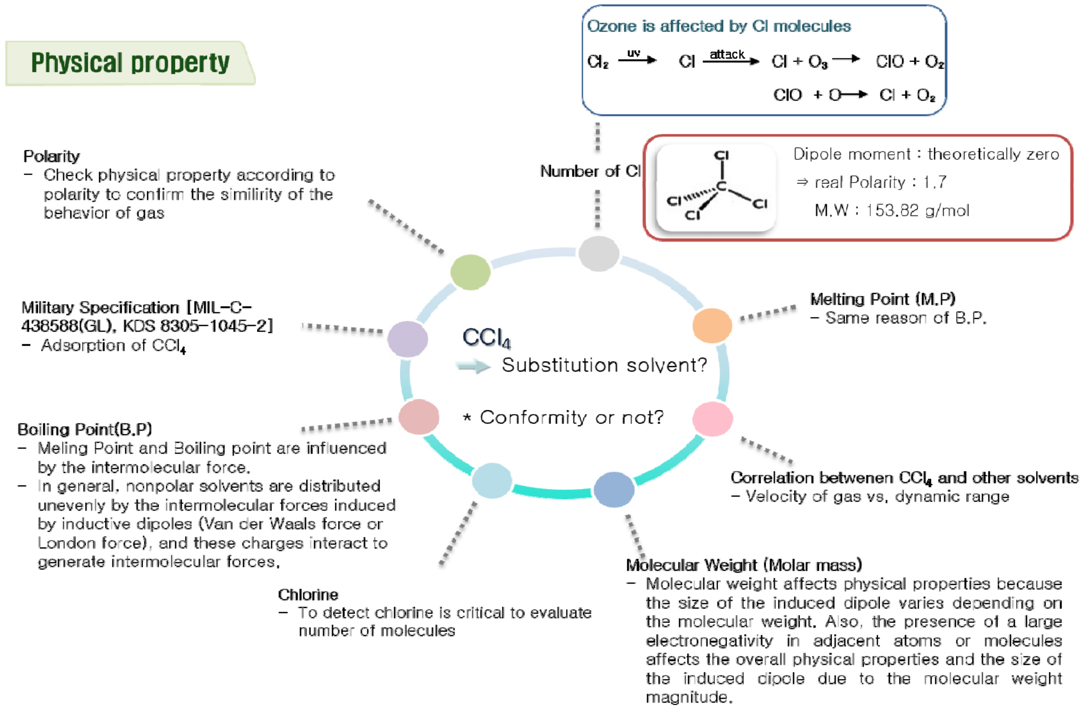
In this paper, we propose a method for measuring the substitution characteristics of carbon tetrachloride by selecting candidates. The substitution solvents were investigated literature and measured by testing method (KDS 8305-1045-2). The results showed that dichoromethane (DM) was confirmed as good candidate of carbon tetrachloride. It was confirmed that the behavior of carbon tetrachloride and DM are similar when the adsorption performance of the permeation protection cloth is proceeded, and that it can be used as an alternative solvent for carbon tetrachloride.



$$Cl_2 \xrightarrow{uv} Cl \xrightarrow{attack} Cl + O_3 \longrightarrow ClO + O_2$$

$$ClO + O \longrightarrow Cl + O_2$$

Dipole moment : theoretically zero
⇒ real Polarity : 1.7
M.W : 153.82 g/mol

Polarity
- Check physical property according to polarity to confirm the similirity of the behavior of gas

Military Specification [MIL-C-438588(GL), KDS 8305-1045-2]
- Adsorption of CCl_4

CCl_4
Substitution solvent?
* Conformity or not?

Melting Point (M.P)
- Same reason of B.P.

Boiling Point(B.P)
- Meling Point and Boiling point are influenced by the intermolecular force.
- In general, nonpolar solvents are distributed unevenly by the intermolecular forces induced by inductive dipoles (Van der Waals force or London force), and these charges interact to generate intermolecular forces.

Correlation betwenen CCl_4 and other solvents
- Velocity of gas vs. dynamic range

Chlorine
- To detect chlorine is critical to evaluate number of molecules

Molecular Weight (Molar mass)
- Molecular weight affects physical properties because the size of the induced dipole varies depending on the molecular weight. Also, the presence of a large electronegativity in adjacent atoms or molecules affects the overall physical properties and the size of the induced dipole due to the molecular weight magnitude.

[1] Korea Defense Standard KDS 8305-1045-2 CLOTH(1), LAMINATED
[2] Sang-Hoon Park, The Korea Institute of Military Science and Technology 15, 2 (2012) 193
[3] Gye-Soon Hwang, Chemical Engineering 36, 2 (1988) 159

SPⅢ-4

Ethics in analytical sciences

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The results of scientific research not only give scholars honor to scientists, but they can also bring wealth to the researchers through intellectual property rights.[1] As competition for research funding, research themes, and research outcomes becomes more and more intense, the level of ethics required by researchers is increasing with exposure to various temptations. If the results of analytical scientists are verified or reported to be incomplete, this may be a social issue and cause big confusion. In addition, there are a number of cases where lawsuits are filed due to analysis results and patents related to various interests. Therefore, in this presentation, I would like to mention the basic ethics of science and technology that analytical scientists should observe. In addition, we will discuss the chain-of-custody, traceability, and the method of writing a research note that can protect the researcher from the lawsuit and demonstrate the validity of the test method.

[1] A. E. Shamoo, D. B. Resnik, *Responsible conduct of research*, 2’nd Edition; NewYork: Oxford, 2009.

Symposium Ⅳ

-의약학-

SPⅣ-1

Metabolomics-guided metabolite profiling of itraconazole in human

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Itraconazole (ITZ) is a first-generation triazole-containing antifungal agent that effectively treats various fungal infections. As ITZ has a better safety profile than that of ketoconazole (KCZ), ITZ has been used worldwide for over 25 years. However, few reports have explored the metabolic profile of ITZ, and the underlying mechanism of ITZ-induced liver injury is not clearly understood. In the present study, we revisited ITZ metabolism in humans, using a non-targeted metabolomics approach, and identified several novel metabolic pathways including *O*-dealkylation, piperazine oxidation, and piperazine-*N*,*N'*-deethylation. Furthermore, we explored the formation of reactive ITZ metabolites using trapping agents as surrogates, to assess the possibility of metabolism-mediated toxicity. We found that ITZ and its metabolites did not form any adducts with nucleophiles including glutathione, potassium cyanide, and semicarbazide. The present study expands our knowledge of ITZ metabolism and supports the suggestion that ITZ has a better safety profile than that of KCZ in terms of metabolism-mediated toxicity.

SPⅣ-2

Content changes of phenolic compounds depending on the ripeness and processing method of *Prunus mume* fruits

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The fruit of *Prunus mume* Sieb. et Zucc (Rosaceae) called as maesil in Korea has been widely used in a valuable source of food as well as traditional oriental medicines for the treatment of emetic, tussis, sputum, diarrheal, and pyretic diseases [1]. The usage of *P. mume* fruits as sources of food and herbal medicines is dependent by the ripeness and processing method of fruits. In recent, phenolic compounds such as neochlorogenic acid, mumenose P, (+)-lyoniresinol isolated from *P. mume* fruits have been reported with new various bio-activities such as anti-virus activities, immune enhancing activity by many researchers [2]. Content changes depending on some for some phenolic compounds by Miatani *et al*. have been reported [3]. However, content changes of phenolic compounds by the simultaneous ripeness and processing method of *P. mume* fruits have no report until now. Therefore, this study aims to develop the simultaneous HPLC analytical method for the quantification of nine phenolic compounds and evaluate content changes with the ripeness and processing method of *P. mume* fruits. The nine compounds used were neochlorogenic acid, benzyl-β-D-glucopyranoside, β-D-glucopyranosyl benzoate, amygdalin, 3,4,5-trimethoxyphenyl-β-D-glucopyranoside, prunasin, benzyl-α-L-arabinopyranosyl-(1→6)-β-D-glucopyranoside), benzyl-β-xylopyranosyl-(1→6)-β-D-glucopyranoside and (-)-epicatechin. The samples used were 21 species of unripe and ripe fruits. HPLC analysis was performed with analytical conditions using a PFP column (150 x 4.6 mm, 2.6 μm) under a gradient condition with (A) 20 mM sodium dihydrogen phosphate sol. (pH 4.0) – methanol - acetonitrile (98:1:1) and (B) 20 mM sodium dihydrogen phosphate sol. (pH 4.0) – methanol - acetonitrile (20:40:40) at column temperature of 40 ℃ and wavelength of UV 210 nm. Developed analytical method was estimated by validation parameters such as specificity, linearity, precision and accuracy of intra-day and inter-day and recovery. In results, the content of nine phenolic compounds with ripeness between unripe and ripe fruit of *P. mume*, all nine phenolic compounds in ripe fruits more than unripe fruits were reduced. Also, all compounds in whole part of nine compounds in ripe fruits were reduced, while amygdalin and prunasin as cytotoxicity compounds in seed part of ripe fruits were increased. Therefore, the processing products of *P. mume* fruits to remove the seeds from whole fruits is meaningless. On the one hand, nine compound contents in all products treated with various processing methods were generally reduced more than in fresh, while amygdalin as cytotoxicity compound in other processing products except for sugared fruits and food garnish were increased. In conclusion, the best as the sources and processing methods for development of functional foods are the food garnish and sugared products using unripe *P. mume* fruits. And, it is shown that the unripe fruits in the usage of *P. mume* fruits as food processing products or herbal traditional medicines from old times are better than the ripe fruits.

[1] Y. Liu, Chinese Academy of Medical Science Peking Union Medical College, Beijing, (2013) 267.
[2] X. T. Yan, *Food Chemistry*, 77(3) (2013) 1623.
[3] T. Miatani, *Biosci. Biotecnol. Biochem.* 77(3) (2013) 1623.

SPIV-3

Analysis of neurosteroid profiles in brain and plasma in a stress-induced rat model

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In this study, various neurosteroids in brain and plasma were simultaneously determined using liquid chromatography-tandem mass spectrometry and their profile changes in a stress-induced rats were investigated. The investigated neurosteroids are as follows: progesterone (P4), 5α-dihydroprogesterone (5α-DHP), 5β-dihydroprogesterone, estrone, androstenedione (AE), cortisol, cortisone, corticosterone (CORT), dehydroepiandrosterone (DHEA), pregnanolone (3α,5β-THP), allopregnanolone (ALLO), 11-deoxycorticosterone (DOC), 11-deoxycortisol, pregnenolone (PREG), and 5α/5β-tetrahydrodeoxycorticosterone (5α/5β-THDOC). Brain and plasma samples were processed using solid-phase extraction with methanol and acetic acid (99:1), and derivatized with a hydroxylamine reagent. Separation was achieved within 13 min at a flow rate of 0.4 mL/min with a C18 column (3.0×50 mm, 2.7 µm). The triple quadrupole mass spectrometer was operated in the positive electrospray ionization mode. Using this method, the neurosteroid level variation was quantitated and investigated in the brain and plasma upon immobilization stress in rats. As a result, AE, CORT, DOC, P4, 5α-DHP, 5α/ 5β-THDOC, DHEA, 3α,5β-THP, ALLO, and PREG levels were significantly altered in both the brain and plasma samples when stress was induced. These findings demonstrated that stress leads to the alteration of the GABAergic neurosteroid profile. The present results will be helpful for furthering an understanding of the role of neurosteroids in stressed conditions.

SPⅣ-4

Association study between metabolomic profiling and bioactivity of crop diversity

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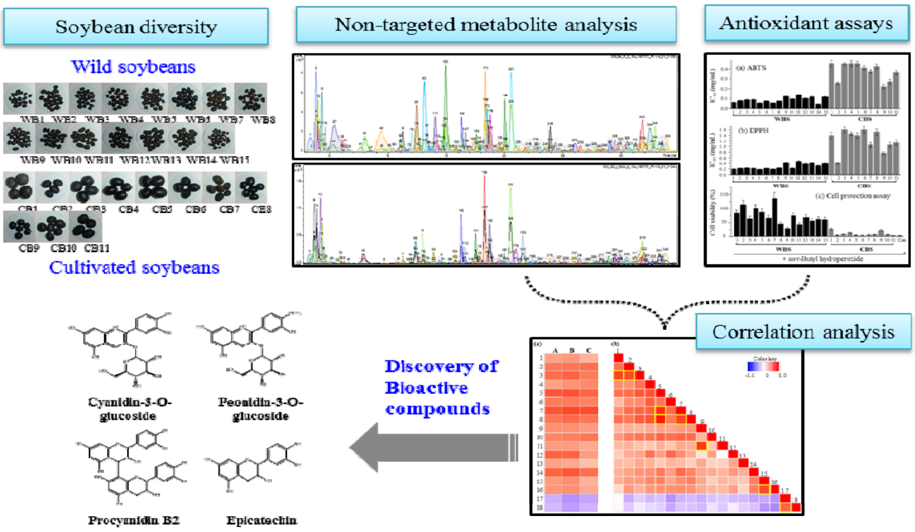
Soybeans are a main crop in terms of economic and nutritional aspects, containing rich amount of protein, starch, and essential minerals, as well as secondary metabolites [1].Wild soybeans are considered a potential resource for soybean domestication and an important source of genetic diversity for soybean crop improvement [2]. Understanding metabolite-caused bioactivity differences between cultivated and wild soybeans is essential for designing a soybean with enhanced nutritional traits. In this study, the non-targeted metabolic profiling of soybean varieties, wild black soybeans (WBS) and cultivated black soybeans (CBS), using liquid chromatography-mass spectrometry (LC-MS) in combination with multivariate analysis revealed significant differences in 25 differential metabolites. Among these, the soyasaponins Ab and Bb were found to be characteristic metabolites expressed more substantially in CBS than in WBS. Three different antioxidant assays and correlation analysis identified major and minor antioxidants that contributed to WBS having an antioxidant activity 4- to 8-fold stronger than that of CBS. Epicatechin, procyanidin B2, and cyanidin-3-O-glucoside were identified by both association analysis and the online LC-ABTS radical scavenging assay as being major antioxidants.



[1] C.W. Xiao, *Journal of Nutrition* 138 (2008) 1244.
[2] Z. Zhou, Y. Jiang, Z. Wang, J. Lyu, *Nature Biotechnology* 33 (2015) 408-414.

DI 분석과학상 수상강연

Development of certified reference materials respond for technological and environmental regulation

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In order to rise the accuracy of measurement using standard materials, it is important to use the matrix CRM(certificated reference material) with similar composition and physical properties. The accuracy of property value should use a very high standard matrix material because it can minimize the measurement error. By supplying the variety of reference materials in industry, the accuracy improvement of measurements can be applied to research and development of high-tech products and advanced to the national testing ability for the industry.

The WTO / TBT agreement aim to eliminate technical barriers to the realization of free trade, emphasizing the adoption, the application, and the conformity assessment of standards, and in particular requires international comparability of test results.

ISO(International Organization for Standardization), as part of international assurance activities, actively develop the international conformity assessment and mutual recognition under the "One Standard, One Test, Accepted Everywhere"

In addition, accuracy is to demonstrated for the test results of the import and export goods in international trade, and standard traceability were performing by standard materials in the test of results research and development.

It may appropriately respond to the technical or environmental regulation in global market. According to industrial and environment needs, we designed and developed for various application fields; RoHS and REACH regulation, eco-friendly electronic materials, solar cell, LED, semi-conductor display, and nano material etcs.

This CRM is not only assisted in QCM(quality control material) in the for process control, but also used in measurements, such as calibration, quality control and method validation, as well as for the assignment of values to other materials.

In conclusion, we developed 54 kinds CRMs (paint, asbestos, phthalate-containing polymer, non-ferrous metals and ceramics, LED, display for electrical and electronic material etcs), performed the standards-based infrastructure expansion and development for the production of which was registered in the international database for certified reference materials (COMAR).

[1] ISO Guide 35:Reference materials - General and statistical principles for certification

Early Bird Seminar

Micro sampling techniques for analysis (Axis-Pro)

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Axis-Pro is a micro manipulator system designed to enable micro sampling, which has until now required skilled hand work, to be available for easy use by anyone. By using the pro Axis-Pro micro manipulator system, the burden on the user can be lessened, on top of attaining an accurate sampling, contributing to the work standards, accuracy, and reproduction. In each of the following fields: electronics parts, related liquid crystal parts, medicine, semiconductors, function materials, and chemical goods, we offer the best solution for the micro sampling of foreign substance mixtures production process.

P1급 구두 강연 I

PI Ⅰ-1

Determination characteristics of volatile organic compounds in e-cigarette liquid samples based on headspace-GC/MS analytical technique

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In order to quantify volatile organic compounds (VOCs) contained in electronic cigarette (EC) refill solutions, various pretreatment methods such as solvent dilution, solid-phase extraction (SPE), liquid-liquid extraction (LLE), and headspace (HS) have been applied for the gas chromatography/mass spectrometry (GC/MS) analysis. As major ingredient in EC refill solution is made of as a mixture of propylene glycol (PG) and vegetable glycerol (VG) (e.g., >80%), analytical interference due to their high abundance is inevitable in VOC quantitation. In this study, optimum analytical conditions of HS-GC/MS technique were investigated using VOCs-spiked samples to analyze seven target VOCs (1,3-butadiene, isoprene, acrylonitrile, benzene, toluene, xylene, and styrene) efficiently from EC refill solutions. To this end, relative recovery of VOCs in spiked samples prepared using PG and VG at a ratio of 5:5 were assessed in relation to methanol-based standard solutions (injection volume: 5 uL) with different types of spiked sample concentrations (0.25, 0.5, 1, 2, and 5 μg g^{-1}) and heating time of 20 mL HS vials (5, 10, and 20 min). HS vials containing spiked samples were maintained at 90℃. In general, relative recovery based on HS approach varied drastically with different types of VOCs and heating time of HS vials rather than concentration levels. Average recoveries for all VOCs ranged from 20.9 (1,3-butadiene) to 102% (xylene) for heating time of 20 min. On the other hand, those for heating time of 5 min were in the range of 19.6 (1,3-butadiene) to 44.4% (acrylonitrile). HS analysis is considered as proper pretreatment approach to minimize analytical interference from solvent (PG and VG) for the determination of VOCs which have relatively low boiling points than those of PG and VG.

PI Ⅰ-2

Optimization of the analytical system for the CMIT/MIT aerosol analysis using the thermal desorption technique

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In order to accurately assess the inhalation toxicity of diverse inhalable substances, their quantitative analysis have to be a priority. In this study, the optimal analytical system for the quantitative analysis of methylisothiazolinone (MIT) and methylchloroisothiazolinone (CMIT) which are main components of the humidifier disinfectants the was developed. The sample loss by solution to aerosol conversion was minimized and the CMIT/MIT aerosol properties were evaluated using the analytical system. To this end, the simple thermal desorption technique (TD method) without complicated procedures, such as a solvent absorption & extraction, was used for the analysis of the CMIT/MIT samples [1]. In addition, the CMIT/MIT samples were also pretreated by using the solvent extraction & absorption approaches (solvent method) which are commonly used to pretreatment method for the aerosol samples [2]. The optimal analytical system for the CMIT/MIT analysis was assessed by comparing the results of the TD and solvent methods. In both methods, the concentration of the MIT increased systematically with increasing the CMIT/MIT aerosol concentration (R^2 > 0.98). The MIT content in the aerosol (except solvent) determined by two analytical systems were somewhat similar (MIT content (except solvent) = 1.52% (sample solution), 1.43% (aerosol-TD method), and 1.18% (aerosol-solvent method)). In contrast, the CMIT content in the aerosol were different depending on the pretreatment type. The CMIT content was 2.90% for the TD method, while that for solvent method recorded 0.75% (CMIT content (except solvent) of the sample solution = 4.66%). In addition, the CMIT concentration of the TD method strongly correlated with the aerosol concentration (R^2 values above 0.9). In case of the solvent method, the linearity of the relationship between CMIT and aerosol concentrations was significantly low with R^2 of -0.718. We confirmed that the sample loss of the CMIT with high reactivity occurred in the complicated sampling and pretreatment steps of the solvent method. Consequently, In order to conduct the assessment of the inhalation toxicity, it is important to develop the analytical systems for the inhalable substance analysis using the optimal sampling and pretreatment methods determined by the physicochemical properties of target compounds.

[1] Y.-H. Kim, K.-H. Kim, *Anal. Chem.* 84 (2012) 4126.
[2] J.H. Lee, H.-J. Kang, H.-S. Seol, C.-K. Kim, S.-K. Yoon, J. Gwack, Y.-H. Kim, J.-H. Kwon, *Environ. Eng. Res.* 18 (2013) 253.

PIⅠ-3

Simultaneous determination of cyanobacterial toxins in river water by liquid chromatography-tandem mass spectrometry

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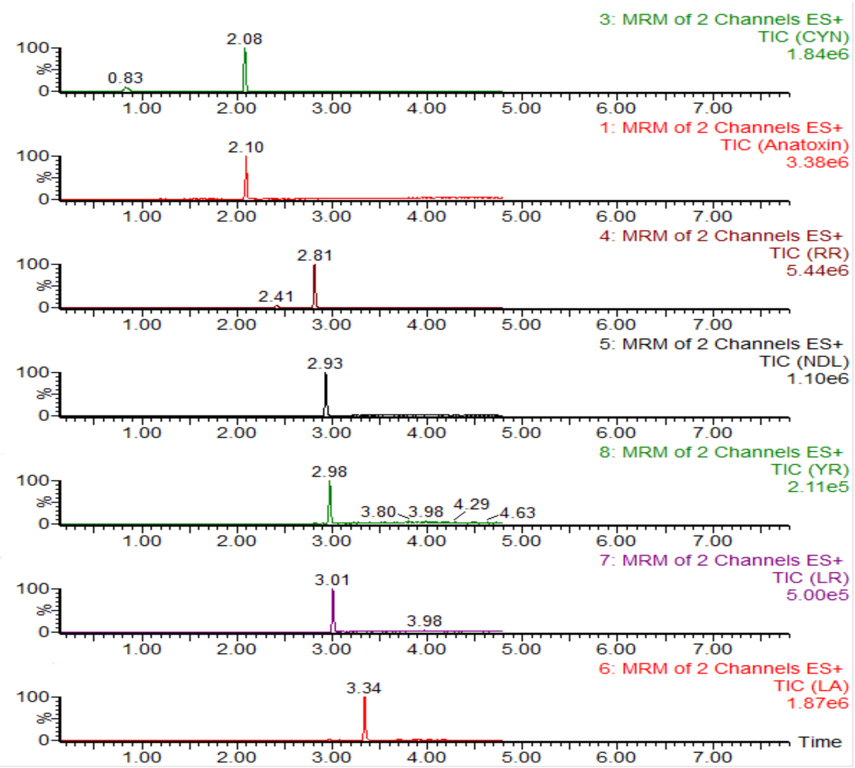
Water bloom, formed by cyanobacteria such as *Microcystis*, *Aphanizomenon*, *Anabaena* has been occurring frequently in lake and river, Korea [1]. It is need to develop a sensitive method for determination of cyanobacterial toxins to control potential hazard in raw water resources. In this study, we developed a highly sensitive analytical method of seven cyanobacterial toxins (microcystin-LR, -RR, -YR, -LA, anatoxin-a, nodularin, cylindrospermopsin) using liquid chromatography-tandem mass spectrometry (LC-MS/MS) with direct injection. The method was evaluated in terms of linearity of calibration curve, method detection limit and limit of quantitation, accuracy and precision, and the adequate values were obtained. The concentrations of seven cyanobacterial toxins were measured in river water from Nakdong river and microcystin-LR, -RR, -YR were detected in river water.



[1] W. A. Wickramasinghe, G. R. Shaw, Kor. J. Env. Hlth. 31 (2005) 192.

PI Ⅰ-4

Development and validation of 7 acidic pesticides residue methods based on QuEChERS

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Multi-residue method for the simultaneous and rapid analysis of 320 pesticides has been used to make sure safety for the agricultural product of pre-harvest. Acidic pesticides not included in 320 pesticides should be used with another method such as a single method. Most of the single method is based on liquid/liquid partition and conventional gas chromatography (GC) and high-performance liquid chromatography (HPLC) system. But these methods take a lot of time and effort in pretreatment steps including extraction and clean-up. Two multi-residue methods covered 7 acidic pesticides (Chlorothalonil, Captan, Folpet, MCPA, MCPB, Triclopyr and 2,4-D) in the representative export agricultural product(apple, pear, paprika, strawberry, and tomato) were developed using a modified QuEChERS combined with liquid chromatography-tandem mass spectrometry(LC-MS/MS). To validate developed method, five agricultural commodities spiked with two concentration levels of 10 and 100 μg/kg. The recoveries were within 70 ~ 120% with relative standard deviation (RSD) of 20% and the limit of quantification (LOQ) of methods were below 10 μg/kg, and the correlation coefficient (r^2) of matrix-matched standards were > 0.99. The recoveries, LOQ, and repeatability achieved, meet the needs of tolerance level monitoring of these pesticides in the agricultural export product.

PI Ⅰ-5

Development and validation of single residue methods for benfuracarb, ethoxyquin, prohexadion-calcium, kasugamycin, and validamycin a based on QuEChERS

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The advancement of the mass spectrometer which has the quick and easy preparation of the sample, rapid and simultaneous detection has become possible to analyze the residue of hundreds of pesticides. However, some pesticides are unfeasible to be analyzed at a time with other pesticides because of their physicochemical properties. In this study, single residue methods for Benfuracarb, Ethoxyquin, Prohexadion-calcium, Kasugamycin, and Validamycin A based on the QuEChERS sample preparation were developed, and also the validation for each one was performed for five agricultural commodities. For validation of developed methods, two concentration levels of 10 and 100 μg/kg were spiked to five agricultural commodities to perform recovery test. Finally, the recovery for each pesticide was within 70 ~ 120 % with relative standard deviations (RSD) of ≤20%, the limit of quantification (LOQ) for the method was 10 μg/kg, and linear calibration functions with correlation coefficients (r^2) were obtained $r^2 > 0.99$.

PI급 구두 강연 II

PIⅡ-1

Age-dating of the cremated remains and the ink sticks by the accelerator mass spectrometry (AMS)

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Korea Institute of Science and Technology (KIST) has been providing AMS radiocarbon dating services since 2013. Recently, we tried to age-date the cremated remains from the Budist monk and the ink sticks. These samples are the carbonate compound having a high carbon content so it is possible to measure radiocarbon dating.

To avoid misreading the age, cremated remains and ink sticks should be pre-treated in order to remove all possible contaminants. First, each sample is treated by Acid-Alkali-Acid (AAA). Then the sample is oxidized to CO_2 by combustion in Elemental Analyzer (EA). To produce the small amounts of carbon from CO_2 for measurement in an AMS, we cause a chemical reaction between CO_2 and hydrogen that produces carbon (graphite), water under iron powder catalyst in 520°C during 3hrs. To make AMS cathode, the reduced carbon and/or carbon compound is poured in aluminum cathode (target) and then compressed to in press. The surface of graphite target must be homogenous and smooth.

After measuring AMS, we calculated the age of cremated remains and ink sticks and I will show the results and interpretation of these ages.

PIⅡ-2

Anaysis of trace elements in low-melting metals using GD-MS

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The gallium metal is a representative metal of a low melting point metals and is used as a raw materials of compound semiconductors such as GaAs and GaN. Gallium metal for compound semiconductors requires a purity of at least 99.999%.

In this study, high purity gallium was prepared and trace impurities were analyzed using glow discharge mass spectrometer(GD-MS) equipment. GD-MS analysis has the advantage that samples can be analyzed directly without chemical treatment. It is also independent of the shape and size of the samples.

In this study, we analyzed the effect of GD-MS analysis on the shapes(pin and plate) of gallium metals. The length of the pin samples were 9 to 19 mm at 2mm intervals. The optimized length was 13 mm and the ion intensity was 9×10^{7} cps. On the other hand, when the sample type is a plate, the ion intensity is 9×10^{8} cps. As a result, it was found that ionization occurred 10 times more than the pin sample in the plate sample. The reason for this is as follows. First, the cooling efficiency is good in plate type sample holder than pin sample holder. Therefore, discharge condition in plate sample is 1.1 kV, 1.4 mA that is higher than pin sample. Second, ion distribution in plate sample fixed in the direction of exit slit. But ion distribution in pin sample mainly consistent in vertical direction of exit slit. So, when ion moves into the exit slit, the pin sample act as a wall. Thus, ions impact the pin sample and becomes neutral.

PIⅡ-3

Application of supercritical fluid chromatography to examination of LCD cell materials and their impurity

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In liquid crystal display (LCD) cell, contamination of sealant, polyimide, liquid crystal, color photoresist (PR) and other materials causes display failures such as Mura and image sticking. An sources of the contamination can be identified by the difference between OK and NG sample. However, impurity are not easily detected by gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS), due to detection limit in analysis instrument, characteristic and matrix effect. Thus, this study examines how to detect low level impurities that exist in a LCD cell by using supercritical fluid chromatography (SFC) plus MS techniques and investigates more impurities from NG samples compared with OK samples. When using SFC-MS, we can reduce the matrix effect of solvent and improve resolution. And then we can detect impurity in NG sample more than OK sample, identify difference between OK & NG sample. For this study, we have to optimize SFC method. In particular, when MS is used as a detector, co-solvent rate is very important because of ionization efficiency. If co-solvent rate is too low, ionization efficiency will be poor in APCI. In addition, a lot of factors are need to be optimized. For example, co-solvent rate, solvent gradient, column, column temperature, auto back pressure regulator (ABPR), solvent flow rate and MS condition.

PI Ⅱ-4

Uranium speciation in groundwater using laser spectroscopy

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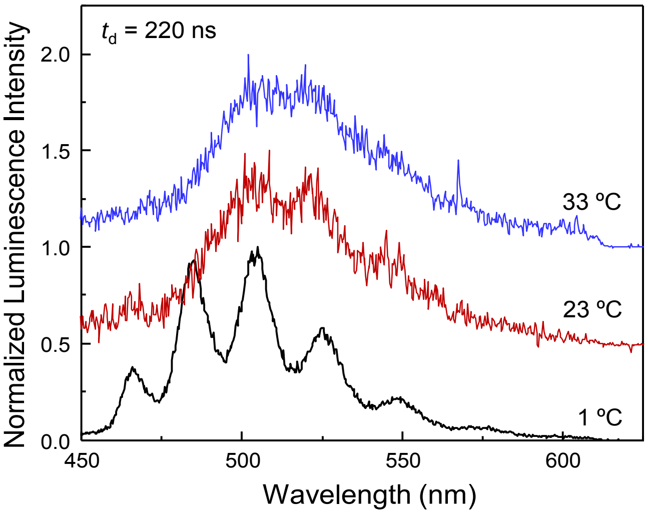
The concept of 'speciation' is defined as 'the process of identifying and quantifying the different, defined species present in a material' [1, 2]. In the present study, time-resolved laser fluorescence spectroscopy (TRLFS) was primarily used for the chemical speciation of U(VI) (hexavalent uranium) species in groundwater. TRLFS is considered as very effective technique to analyze trace amounts of uranium in aqueous solutions [3]. A few μM of Ca-U(VI)-carbonate complexes were identified as dissolved uranium species in groundwater [4]. It is very effective to perform the measurement at low temperatures (1 °C in this study) because the luminescence intensities of U(VI)-carbonate species increase significantly at low temperatures. By contrast, an increase in the luminescence intensity of natural organic matter (NOM) in groundwater is indistinctive at low temperatures. Thus, the spectral overlap in the luminescence between NOM and uranium in groundwater can be avoided. The interaction of U(VI) species with NOM in groundwater was also investigated using a laser-based spectroscopic technique.



Time-resolved luminescence spectra of uranium species dissolved in groundwater

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PIⅡ-5

Applications of cryogenic method to water vapor sampling from ambient air for isotopes analysis

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Stable water vapor isotopes have been utilized as a tracer for studying atmospheric global circulations, climate change and paleoclimate with ice cores. Recently, since laser spectroscopy has been available, water vapor isotopes can be measured more precisely and continuously. Studies of water vapor isotopes have been conducted over the world, but it is the early stage in south Korea. For vapor isotopes study, a cryogenic sampling device for water vapor isotopes has been developed. The cryogenic sampling device consists of the dewar bottle, filled with extremely low temperature material and impinger connected with a vacuum pump. Impinger stays put in the dewar bottle to change the water vapor which passes through the inside of impinger into the solid phase as ice. The fact that water vapor has not sampled completely leads to isotopic fractionation in the impinger. To minimize the isotopic fractionation during sampling water vapor, we have tested the method using a serial connection with two sets of impinger device in the laboratory. We trapped 98.05% of water vapor in the first trap and the isotopic difference of the trapped water vapor between two impinger were about 20‰ and 6‰ for hydrogen and oxygen, respectively. Considering the amount of water vapor trapped in each impinger, the isotopic differences for hydrogen and oxygen were 0.33‰ and 0.06‰, respectively, which is significantly smaller than the precision of isotopic measurements. This work can conclude that there is no significant fractionation during water vapor trapping.

PIⅡ-6

Water quality improvement of small water supply systems in rural area

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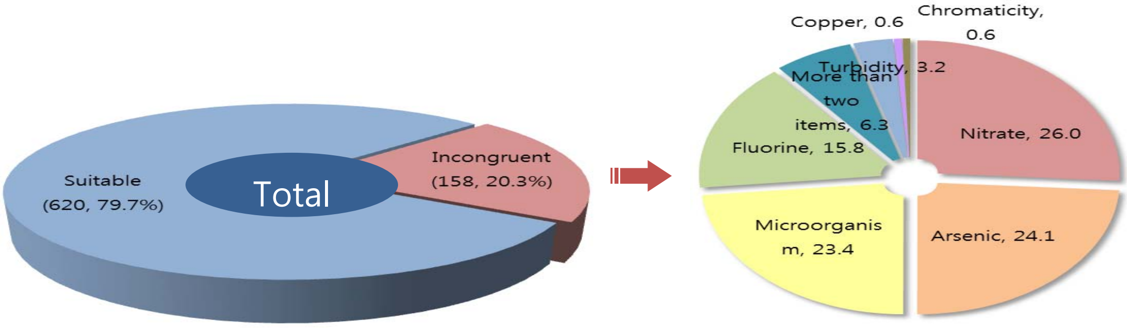
Everyone has a right to use water fairly. Unfortunately, the right is unfairly given and imbalanced regionally. This study has been launched into all small water supply systems, established in Chungcheongnam-do area for a four-year period; 2016 to 2019. This is the report investigated from 2016 to 2017. The obtained results are; totally 158 facilities (20.3%) out of 778 facilities in seven self-governing bodies exceeded the drinking water quality standard of Korea.



The nonconforming rate in Cheonan region was higher than the other six regions. 65 facilities (37.4%) among 174 facilities were unsuitable for the standard. Arsenic and nitrate content exceeded the drinking water standard of Korea were 27 facilities (15.5%) and 17 facilities (9.8%) respectably. In Nonsan and Gyeryong region, 40 facilities (23.1%) out of 173 facilities exceed the standard. The major factor is considered to be the poor operation of the chloride disinfection equipment. The As content exceeded the drinking water standard in each 10 facilities among 76 facilities (13.2%) for Asan region and 124 facilities (8.1%) for Dangjin region. Upon intensive tests for the 10 facilities that exceed the standard of As the issue is revealed to be the poor management of the filtration medium of water treatment process. In Geumsan region, 21 facilities (15.7%) among 134 facilities exceed the standard. Particularly, the fluoride content was analyzed at an average of 2.6 mg/L which exceeds the standard, 1.5 mg/L. In Hongseong region, 12 facilities (12.4%) among 97 facilities, the nitrate concentration was detected at an average of 12.9 mg/L which exceeds the standard. By doing this, this study aims not only to improve the water quality of the small water supply systems, but also to contribute to potential fields worthy of environmentally-healthy policies applied to rural areas of Korea.

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최신 분석기술 특강 I

Identify more unknowns and find real difference using complete discovery solution for small molecule identification and characterization

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Thermo Scientific™ Compound Discoverer ™ software is a flexible solution that offers a full suite of powerful tools to address mass spectrometry-based (MS) small molecule differential analysis, identification, and pathway mapping. Compound Discoverer software is the only small molecule analysis solution able to make full use of the high-resolution accurate-mass (HRAM) data provided by powerful Thermo Scientific ™ Orbitrap mass spectrometer instruments. To solve big challenges in many applications, we will introduce small molecule discovery hardware and software solution.

HPLC method development for efficient analysis and introduce of thermo accucore column

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In reversed phase HPLC, the condition of the mobile phase is one of the important factors to analysis result. In this session, present ‘Selection to characteristic of organic solvent’, ‘The pH value of the mobile phase to obtain reproducible results’, ‘Appropriate buffer selection to effectively maintaining the pH value’ and ‘Column maintenance for maximized life-time’. Also introduce the principles of the ion-pair method & Hilic mechanism through various applications and then the solution for common troubles (no-reproducible, split peak, reduced column life-time etc.) using this methods.

Especially, introduce the Accucore column which is a widely used solid core technology from Thermo Scientific.

최신 분석기술 특강 II

특강 Ⅱ

Recent analytical technologies for foods and consumer products safety issues

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Recently, Europe’s eggs-contamination scandal has spread worldwide and as far as South Korea. We have already experienced melamine scandal, toxic humidifier sterilizers scandal, toxic sanitary pads scandal and so on. The reliability of the analysis results is critical in these scandals. Conventional Gas Chromatography (GC) and Liquid Chromatography (LC) method has limited sensitivity and selectivity. So, GC and LC Triple Quadrupole Mass Spectrometry (MS/MS) have been used for the analysis of Foods and Consumer Products contaminants. These method has shown good sensitivity and selectivity in real samples but still troubles in matrix effect for recovery. High Resolution Mass Spectrometry Technology such as Quadrupole-Time of Flight (Q-TOF) is ideal solution for the screening of contaminants in complex matrices. This presentation will cover the recent analytical results using MS/MS and Q-TOF technologies for screening of contaminants in Foods and Consumer Products

Leco 젊은 분석과학자상 수상강연

Deep eutectic solvents as an efficient medium for one-step sample preparation for the chemical characterization of aromatic herbs

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Deep eutectic solvents (DESs) are the eutectic mixtures of H-bond acceptor and donor formed via H-bonding interactions. They are generally considered more desirable than ionic liquids (ILs) because they do not only possess the merits of ILs such as inflammability, involatility, and tunability, but also are easy to prepare with cheap, biodegradable, and non-toxic compounds unlike ILs. Accordingly, exploitation of DESs as a new generation green solvent has been gradually increasing. In our laboratory, we have investigated DESs as a tunable, eco-friendly, and efficient media to extract a variety of bioactive compounds from different sources. In this talk in which peppermint leaves (*Mentha piperita L.*), a valuable source of essential oil, was used as a model system, application of DESs as an efficient medium for one-step sample preparation for the characterization of aromatic herbs is presented. In conventional ways, the chemical characterization of aromatic herbs involves discontinuous and time-consuming procedures to prepare two types of extracts to examine volatile monoterpenes and relatively polar phenolic compounds. In our study, we produced a DES, namely CG, composed of choline chloride and glucose and used it for the extraction of volatiles and phenolics with high efficiency. The peppermint extracts produced at the statistically optimized conditions contained sufficient amounts of both classes of compounds and therefore, could be directly used for chromatographic analysis of volatiles and phenolics analysis including total phenolic content, total flavonoid content, and antioxidant activity. For the analysis of volatiles, a headspace solid-phase microextraction coupled to gas chromatography was used in order to cope with the negligible volatility of DES introduced with the extract.

Special Session Ⅰ

-식품 중 농약 분석-

SS Ⅰ -1

Analytical methods of pesticide residues in the food code

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The Ministry of Food and Drug Safety (MFDS) has been setting pesticide MRLs (Maximum Residue Limits) as per Article 7 of the Food Sanitation Act (Article 5-2 of the Enforcement Decree of the Food Sanitation Act), and has been developing standard analytical methods, which are published in the Food Code. As of September 2017, the announcement of the “Notice No. 2017-57 of the Ministry of Food and Drug Safety” lists three categories of pesticide residue tests (i.e., single analytical method, analytical methods for pesticide multi-residues, and screening) for agricultural products, livestock products, and ginseng, with 237, 55, and 2 analytical methods, respectively. Recently, pesticide metabolites, in addition to parent compound, were included in the definition of pesticide residue. Further, as per the introduction of the Positive List System(PLS) in Korea in December 2016, pesticides without established MRLs are now uniformly noted as “not detected(0.01 mg/kg, nuts and seeds, assorted tropical and sub-tropical),” PLS is demanding remarkably more qualitified analytical techniques, such as techniques with limit of quantitation for even trace amounts and simultaneous analytical methods that detect metabolites. In response to the demands, simultaneous analytical methods using mass spectrometers are currently being developed. Moreover, the NIFDS(National Institute of Food and Drug Safety Evaluation) of the MFDS published the “Guidelines for standard procedures for developing analytical methods for food.” in April 2016 and is developing analytical methods accordingly. The MFDS will continue to contribute the safety of food for people by making every endeavor to develop standard methods for determining that pesticide residues in food.

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SS Ⅰ -2

A review on status of pesticides registration in korea

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Pesticides are used for increasing the agricultural productivity and safeguarding the public health[1]. This paper analyses the trend of pesticide registration, management and consumption in Korea. All pesticides manufactured, imported and consumed are supposed to be registered to the authority of the Korea Rural Development Administration (KRDA) by the Pesticide Control Act (PCA) in Korea. In article 40 of PCA, there are two kinds of criteria for safe use of pesticides followed as: “Each pest controller or user of pesticides, etc. shall use pesticides, according to the Guidelines for the Safe Use of Pesticides (GSUP), and each manufacturer, importer, dealer or pest controller shall handle pesticides, etc. in accordance with the Standards for Restrictions on the Handling of Pesticides (SRHP). The purpose of this Act is to promote improvement in the quality of pesticides, the establishment of order in the distribution and safe use thereof, and to contribute to agricultural production and the conservation of the living environment by prescribing matters concerning the production, importation, sale, and use of pesticides. Term "pesticide" means fungicides, insecticides, and herbicides used for controlling germs, insects, mites, nematodes, viruses and weeds[3]. The status of pesticides registration listed 492 active ingredients, 29 biopesticides and 1,917 items, (625 fungicides, 548 insecticides, 585 herbicides, 57 growth regulators and 102 others) on the KRDA by June 2017 in Korea. Pesticides used in Korea were grouped by four classes of hazard (I; extremely hazardous, II; highly hazardous, III; moderately hazardous, and IV; slightly hazardous) for human toxicity based on acute oral and dermal toxicity to the rat [2]. Among the registered 1,917 pesticide items were classified 4(0.2%) highly hazardous(II), 264 (13.8) moderately hazardous(III) and 1,648(85.9%) slightly hazardous(IV). Korea ranked as top group largest user of pesticides (9.5 kg/ha) among OECD countries in 2016. So, in the aspect of safety and health, pesticide is one of the most important chemicals that should be carefully controlled in Korea. For use of pesticide, the main challenge is to reduce the risks to human health and ecosystems, while increasing the level of crop productivity.

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SS Ⅰ-3

Development of rapid analytical method for glyphosate residue in agricultural products using HPLC- MS/MS

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Glyphosate is known as the non-selective pesticide used world-widely [1]. It is also used to get rid of weeds for Generically Modified Organisms (GMO) crops such as soya bean, corn, and wheat, and to desiccate the crop before the harvest for getting ready for next year's crop for the non-GMO crop [2]. It is listed as a probable carcinogen by International Agency for Research on Cancer (IARC) and being reported to link to celiac disease (gluten-sensitive enteropathy) that is a serious autoimmune disorder in the ingestion of gluten in the small intestine [3]. To ensure food safety, it has been emphasized to need for monitoring the domestic and imported agricultural products. The analytical method for determination of glyphosate residue using High-Performance Liquid Chromatography-tandem mass spectrometry (HPLC-MS/MS) was developed to be rapidly analyzed right after extracting without derivatization compared to the official analytical method of Food Code for glyphosate. The developed method was verified through measuring soybean sample spiked with two concentration levels of 0.05 mg/kg and 0.5 mg/kg for accuracy and precision according to CODEX guideline (CAC/GL40) [4]. In result, Limit of Detection (LOD) of the method was 1.9 ug/kg, and Limit of Quantification (LOQ), 5.8 ug/kg, the recoveries, between 94.0 ~ 95.2 %, relative standard deviation, lower than 5 %, the coefficient of correlation, >0.9992. Therefore, developed method can be used as analyzing method that is more effective and rapid to determine the glyphosate residue in agricultural products.

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SS Ⅰ -4

Pesticide residue analysis in environmental samples

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Pesticides, which are essential equipment in modern agriculture, should be residued to achieve their purpose for a certain period after they are applied in the environment. Although modern pesticides are relatively low in toxicity to human beings, it is very important to investigate the pesticide residue pattern in the environment in order to secure pesticide safety. Residue analysis of pesticides are consisted to single residue analysis and simultaneous multi-residue analysis, which are chosen according to the purpose of analysis. The method of pesticide residues analysis must be provided in the development process of pesticides by the developer to registrate new pesticide. in the past, the development of pesticide analysis method was very difficult according to physicochemical properties of pesticide, but the analysis method is easily simplified by the development of high performance analytical instruments in modern. Recently, the development of pesticide analytical method focuses mostly on the simultaneous multi-residue analysis method after the development of the QuEChERS method. While the traditional single residue analysis of pesticides involves extraction, partition, clean-up, and instrumental analysis process. Recent trends, however, have only included the extraction, clean-up and instrumental analysis process, and partition processes are omitted. Even the purification process may be omitted. The multi-residue analysis method has been developed as an improvement of the QuEChERS method. By using GC/MSMS or LC/MSMS method, sample pretreatment is easily simplified, and more than 330 kinds of pesticides can be analyzed to a concentration of less than ppb level. In residue analysis of pesticide, the environmental sample is almost similar to the residue analysis of foods or agricultural commodities, but the residue analysis method should be slightly modified depending on the physicochemical properties of the sample, such as soil and water. Since nitrogen-containing pesticides could be strongly bound to soil organic matter, methods should be modified for effective extraction of these, such as using an acidified solvent. In the case of a water sample, when the target pesticide is lipophilic, the method is almost the same as the other method. However, when it is hydrophilic, the method should be become very difficult.

Special Session II

-잔류성 유기오염물질 (POPs) 분석-

SSⅡ-1

Long-Range atmospheric transport of particulate matters and persistent organic pollutants

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Recently, long-range atmospheric transport (LRAT) of particulate matters (PM) is a great environmental concern in Korea. The chemical composition of PM is critical to evaluate the toxicity of PM which is both transported from China and locally originated. Even though persistent organic pollutants (POPs) associated in PM and the gaseous phase also undergo LRAT, surprisingly small numbers of studies have focused on this issue in Korea. In this presentation, the reasons why LRAT of POPs has not been fully studied yet in Korea will be explained, and the results of previous studies in Korea and recent studies will be presented. Finally, strategies for the monitoring of LRAT of POPs will be proposed.

What will be the evidence of long-range atmospheric transport of POPs?

SSⅡ-2

Analytical methods for organochlorine pesticides (OCPs) in sediment cores

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Persistent organic pollutants (POPs), especially organochlorine pesticides (OCPs) are chemicals that remain intact in the environment for a long period, bio-accumulated in the living organisms and cause adverse effects at trace levels on human health and environment. As with most OCPs at trace levels in environment, extraction/concentration is required as part of the analytical procedure in order to increase the analyte concentration to a level where it can be detected by the analytical technique used. By automating the cumbersome clean-up procedures, multichannel plunger pump (Dioxin Cleanup Pump Unit DPU-8B) helps to increase the sample throughput and improves the quality of analytical results. This method provides the best separation and clean-up procedures for dioxins, PCBs, and OCPs [1]. Thus, this clean-up system leads to more efficient and effective outcomes for many analysts.

Based on our separation and clean-up method [1,2], we investigated the vertical concentrations of OCPs and the specific compositional characteristics in the sediment cores.

In Japan, the nationwide HCHs usage was approximately 400 metric tons. Therefore, it can be assumed that HCHs contamination might have occurred through the use of technical-grade HCHs until the early 1970s. The decreasing trend for composition of an isomer and the increasing trend for the β-isomer after they were officially banned in the early 1970s were observed in upper layer in Ariake Bay sediment cores, Japan [3]. This implies that HCHs contamination in upper cores might have originated from a relatively remote source or long-time accumulation after dispersing. The ratios of (DDE+DDD)/ΣDDTs in the sediment cores ranged from 0.65 to 1.00. The ratios were declining toward down cores, which it could be explained that DDT emission occurred in the past input. The banned pesticides were buried in one location in Fukuoka Prefecture, Japan. Therefore, it can be assumed as a possibility that it might be reflected by buried pesticides somewhere after banning them in the 1970s.

The distribution of OCPs in Gwangyang Bay, Korea was elucidated based on the vertical and horizontal distributions in sediment [4]. The observed ratio (DDE+DDD)/ ΣDDTs, which was below 0.6, in the top sediment layer sufficiently indicated that it was caused by the recent input of technical DDTs. Regarding CHLs, the residues in the sediment core were caused by the past input, based on the ratio of trans-nonachlor to trans-chlordane, which was below 0.5. The distribution of HCB concentration in the sediment core during the past 50 years indicated that its emission source was from combustion rather than agricultural impurities. HCHs were high during past usage. The increasing concentration of HCB and mirex in the top sediment layer might reflect transport from somewhere because, these were banned in Japan and Korea, in the past.

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Study on the POPs national standard method of decabromodiphenyl ether in Korea

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It is necessary to establish the infrastructure for implementing the Stockholm Convention for new Persistent Organic Pollutants (POPs). Decabromodiphenyl Ether (deca-BDE) was listed annex A with specific exemption at the 8th Conference of the Parties in Stockholm Convention. We standardized the POPs National Standard Method in water and ambient air for deca-BDE. A Liquid-liquid extraction method was selected for water samples and Soxhlet extraction for air samples. For quantification we selected HRGC/HRMS using an isotope dilution internal standard method and used BDE-#206L as a syringe spike internal standard. Method detection limit (MDL) of deca-BDE was 412.8 pg/L using liquid-liquid extraction in water samples, and 0.78 pg/m^3 in air samples. For the recovery test, $^{13}C_{12}$-BDE-#209L was used in a clean up process. The recovery rate ranged from 89.0 to 142.2 % in water samples and 59.4 to 105.9 % in air samples. These results satisfied the recovery rate from 20 to 200 % in the U.S. EPA 1614 Method. Extraction solvent was changed from toluene to dichloromethane in air samples and reduced a sampling volume from 20L to 2L for water samples. Also, we prepared a guideline to analyze deca-BDE and low brominated diphenyl ethers (from tetra to hepta BDE), separately.

Table 1. QA/QC results of deca-BDE in water and air samples

Matrix	MDL	LOQ	Recovery (%)	
			Min	Max
Water	412.8 pg/L	1,314.8 pg/L	89.0	142.2
Ambient air	0.78 pg/m^3	2.5 pg/m^3	59.4	105.9

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Analysis method of chlordecone and PCNs

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The chlordecone and polychlorinated naphthalenes (PCNs) were registered as persistent organic pollutants (POPs) in the Stockholm Convention in 2009 and 2015, respectively. The chlordecone was used as the pesticide or germicidal agent, usually. However, nowadays it should not be used and produced, because it is classified as prohibited compounds. In Korea, it was not absolutely used until now, and also it is classified as prohibited compound now. PCN was used in past days as the insulator, additive of the engine oil, raw material of the dyestuff and flame retarder, but now the using and production of PCNs are interrupted. Nevertheless, PCNs are emitted from combustion process to the environment as an unintentional production. The parties to an agreement of Stockholm Convention have to monitor the registered compounds as POPs in the Convention. But we can't the monitoring of chlordecone and PCNs in the environment now, because we have no any official method of chlordecone and PCNs. Therefore, in this study the analysis methods of chlordecone and PCNs were investigated for the official methods. To find the proper extraction and clean-up processes, the various methods were compared and the appropriated methods were selected. The quality assurance (QA) and quality control (QC) were performed using the PUF, sand and distilled water injected native standards. The method detection limit (MDL), accuracy and precision were calculated. After QA/QC test, we have analyzed the environmental samples using the selected methods to confirm the applicability of used methods as the official methods. The chlordecone was analyzed by HRGC/HRMS and by HPLC/MS/MS to compare the detectability and PCNs were analyzed by HRGC/HRMS to separate the congeners.

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대학원생 구두 발표 I

GT Ⅰ-1

The occurrence characteristics of heavy metals via vaping of electronic cigarette device

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In this study, the concentrations of six heavy metals (Zn, Pb, Cd, Ni, Fe, and Cr) contained in electronic cigarette (EC) solutions were determined using inductively coupled plasma-optical emission spectrometer (ICP-OES) system in various respects. The concentrations of six heavy metal components were determined from seven EC liquid products under three conditions (Figure): (1) Type I: EC solutions, (2) Type II: EC liquid stored in EC cartomizer (without puffing), and (3) Type III: EC liquid remaining in the EC cartomizer after puffing. For ICP-OES analysis, all EC liquids were diluted by 50 times in 5% HNO_3. The recoveries of six heavy metals were 108±1.88 (Zn), 104±0.97 (Pb), 98.7±1.76 (Cd), 101±5.13 (Ni), 99.4±3.01 (Fe), and 104±3.04% (Cr). The three types of e-liquid samples examined in this experiment were stored up to seven days for the analysis at the first, third, and seventh day. Accordingly, all six components were detected from all three experiments. The increase of heavy metals concentrations in type II was shown at 7 days in zinc, lead, and nickel relative to their type I counterparts. In case of type III, the concentration of heavy metal components increased consistently relative to type I. Based on the results derived from this study, it is suggested that the users of EC are likely to be exposed to heavy metal components when vaping it.

This research was supported by a grant (14182MFDS977) from the Ministry of Food and Drug Safety in 2017

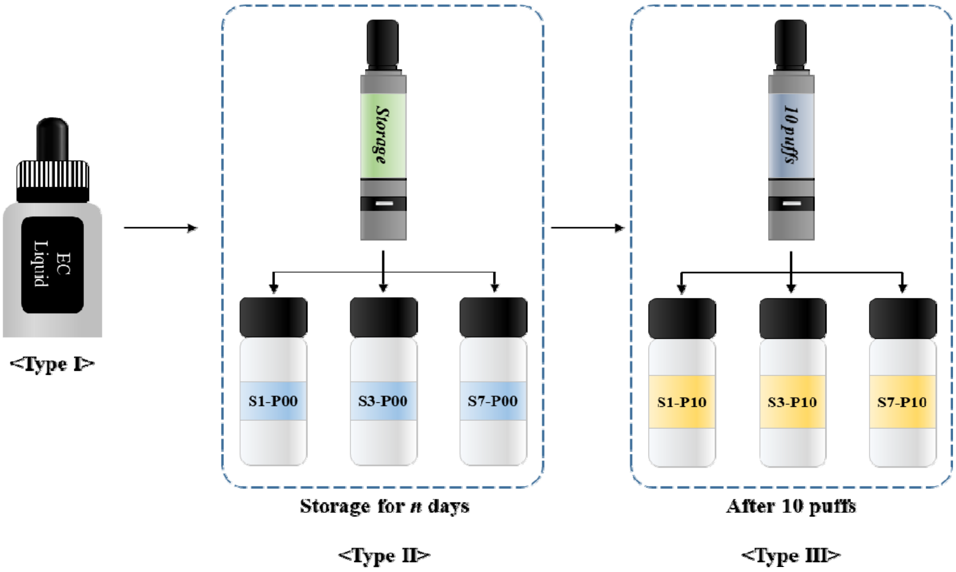

Figure. Illustration of sampling approach for this study

GT Ⅰ-2

A study on gaseous pollutants concentrations in meat cooking with micro-environmental conditions

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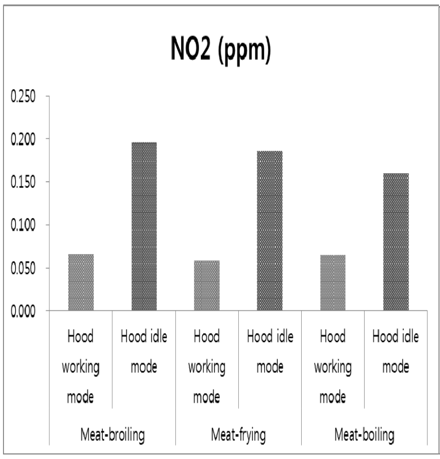
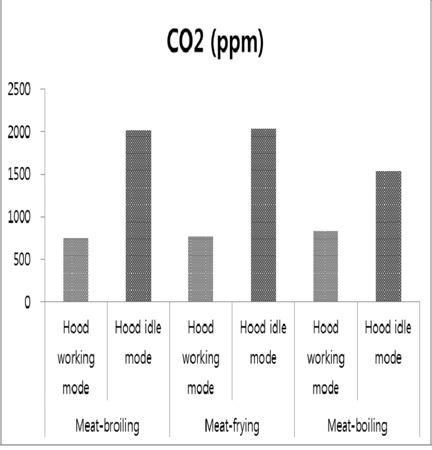
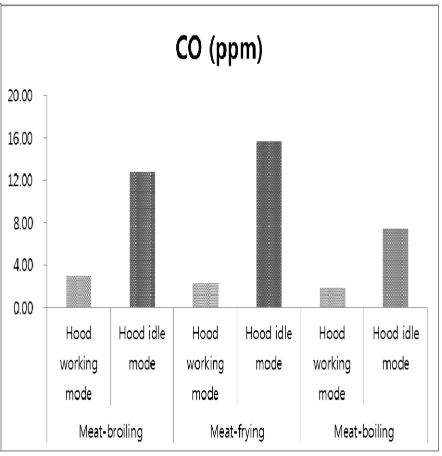
Various pollutants are emitted and released from cooking, smoking, cleaning, and building materials indoors. The IAQ management in the kitchen is remarkably important because considerable pollutants are produced by high temperature and combustion in cooking process and they are able to disperse to all of indoor space in residence. In this study, we are trying to figure out the correlation between the ventilation pattern and the concentration of gaseous pollutants (NO_2, CO_2, CO) in meat cooking.

When liquefied natural gas was burned for 1 hour without ingredients, the concentrations of NO_2 and CO were 6 times and 7.2 times higher than usual situations due to incomplete combustion of liquefied natural gas, respectively. The variations in concentration of gaseous pollutants with altering meat cooking methods were conducted. When the meat was roasted, the concentrations of NO_2, CO_2, and CO were 0.170 ppm, 1,724 ppm, and 6.4 ppm, respectively. In the case of frying the meat, the concentrations of NO_2, CO_2, and CO were 0.154 ppm, 1,772 ppm, and 7.4 ppm, respectively. When the meat was boiled, the levels of NO_2, CO_2, and CO were 0.158 ppm, 1,519 ppm, 5.7 ppm, respectively. In respect of NO_2 concentration, as the concentrations of NO_2 were exceeded the recommended standard value (0.05 ppm) in Indoor Air Quality Act, the elderly and infirm or asthma should give attention to it when they are cooking meat in the kitchen.

As a result of monitoring the level of pollutants for one hour long cooking with 0.4 m/s air flow rate of range hood, the concentration of NO_2, CO_2, and CO were revealed 2.4~3.2 times, 1.9~2.7 times, and 8.5~11.9 times higher respectively comparing with the situation of turning off the range hood. When the power of range hood was lasting 30 minutes after cooking, the average levels of pollutants were diminished as a level of normal condition. However, it is needed more than one hour when the range hood was not used at all.







GT Ⅰ-3

Determination of phthalates in e-cigarette liquid and vapor samples based on quartz wool tube sampling and GC-MS approach

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In this study, relative recovery (RR) of phthalate compounds contained in electronic cigarette (EC) liquid and released from its vaping was assessed based on quartz wool (QW) tube sampling and gas chromatography-mass spectrometry (GC-MS) approach. To this end, three different types of recovery test were performed: [I] 50 times dilution of phthalate spiked samples with methanol, [II] injection of methanol-based phthalate standards into QW tube, and [III] injection of phthalate spiked samples into QW tube. Each sample made from experiment types II and III was then extracted with solvent (methanol) for the GC-MS analysis. In order to investigate the fate of phthalate compounds in relation to the ratio of propylene glycol (PG) and vegetable glycol (VG) used for EC liquids, spiked samples were prepared in two types of mixture (PG:VG=10:0 or 5:5) in light of their common ratios in commercial refill solutions. In addition, spiked samples were made at two different concentration levels (10 and 100 μg mL^{-1}) for experiments of type I and II by injecting adequate amounts of phthalate standards into both types of PG/VG mixture. For type III, three different concentration levels (10, 50, and 100 μg mL^{-1}) of spiked samples were prepared to compare RR of phthalates in relation to their concentration ranges. First, average RR for six target phthalates in type I was 100.7±5.28 (10:0) and 103.1±9.67% (5:5), respectively. On the other hand, average RR in type II decreased slightly as 87.1±16.4% as the samples passed through QW tubes. Lastly, average RR in type III was 79.3±6.9 (10:0) and 74.3±8.3% (5:5). The method detection limit (MDL) values of six phthalates based on these three types of experiments were in the range of 3.34~9.90 μg mL^{-1}. The simple sampling method using QW tube can thus be feasible for the quantitation of phthalates in EC liquid and vapor samples.

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GTⅠ-4

Development of QCM gas sensor with β-CD as selector for sensing 2-nonenal

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Human body odor consists of various kinds of odor components. Among them, 2-nonenal which is representative material of old man odor occurs by oxidation of skin secretion. In order to measure 2-nonenal, gas chromatography-mass spectrometer, GC-MS, can be used as odor analyzer, but this analysis is difficult because of its very expensive cost, long measurement time, and sampling problem of the odor directly. On the other hand, quartz crystal microbalance, QCM, sensor can easily be used for sensing human body odor because of cheap cost, short response time and without sampling. However, in order to use QCM sensor, the selector, which is recognized the human body odor, is need for preparing QCM sensor.

Therefore, we selected the β-Cyclodextrin, β-CD, as recognizing compound to 2-nonenal in order to detection of 2-nonenal. In order to introduce the β-CD onto QCM surface, we synthesized zwitterionic vinyl monomer named by sulfobetaine vinyl imidazole, SBVI, because of soluble β-CD, and then we coated the SBVI with β-CD onto gold-coated QCM electrode. After then we prepared the β-CD-modified QCM sensor by thermal polymerization. The prepared β-CD-QCM sensor is characterized via FT-IR, AFM, SEM, contact angle, and thermal stability in order to confirm successfully preparation. Finally, we measured the sensing efficiency of 2-nonenal in methanol solution.

GT Ⅰ-5

Chemical profiling in surface waters using two types of polar organic chemical integrative sampler (POCIS)

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Increasing occurrence of organic contaminants in the aquatic environment has heightened the need for reliable and efficient monitoring technique. Traditional grab sampling followed by laboratory extraction and instrumental analysis is well established method, but only provides a snapshot of the water quality status. Achieving representative sample with grab sampling takes considerable labour, time and cost. Here, time-integrative passive sampling technique is recognized as an alternative monitoring tool [1]. Passive sampling technique allows the simple sampler construction and application, provision of time weighted average concentration (C_{TWA}) and in situ sampling. Various configuration of passive sampling devices are currently available, one of which is polar organic chemical integrative sampler (POCIS).

POCIS consists of Oasis HLB® sorbent sandwiched between two polyethersulfone (PES) membranes and has been widely used for the detection of hydrophilic contaminants [2]. However, the lag effect from membrane sorption within POCIS has been pointed out as a main limitation as this lead to uncertainties in quantitation of analyte concentration [3]. Therefore, modified configuration of POCIS with polytetrafluoroethylene (PTFE) membrane (POCIS-PTFE), instead of PES membrane, was designed and tested in laboratory and field.

In this study, passive sampling method in combination with LC-MS/MS analysis was used to monitor environmental organic contaminants in a small river and the outflow of wastewater treatment plant (WWTP) in south-western Germany. Two types of POCIS, POCIS and POCIS-PTFE, were deployed in four sampling sites for two weeks and the performance of these samplers was assessed and compared. Twenty two contaminants were detected including 6 priority substances enlisted in EU Water Framework Directive. POCIS-PTFE showed better permeation performance and more resistant to biofouling than POCIS, but slight lag effect was still found in POCIS-PTFE.

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GT Ⅰ-6

Development of sampling and analysis approach for tobacco specific nitrosamines in e-cigarette liquid and aerosol samples

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In this study, an experimental method for the collection and analysis of tobacco specific nitrosamines (TSNAs) contained in electronic cigarette (EC) liquid and released from aerosol samples was developed using a liquid chromatography-tandem mass spectrometry (LC-MS/MS) system under various experimental conditions. As part of this study, relative recovery (RR) of four target TSNAs was assessed in relation to two different types of parameters: [1] types of extraction solution (acetonitrile (ACN) and ammonium acetate (AA)) and [2] types of sampling filters (cambridge filter pad (CFP) and quartz wool (QW) tube). The three concentration levels (100, 500, and 1000 ng/mL) of spiked samples were prepared using propylene glycol (PG) and vegetable glycerin (VG) at a ratio of 5:5. For the determination of TSNAs in EC refill solutions, direct dilution method was applied to liquid samples using two different types of extraction solutions (100% ACN and 100 mM AA) at a fixed dilution factor of 50. The RRs for four target TSNAs were too high when samples were diluted with ACN such as 152±83.3 (N'-nitrosonornicotine: NNN), 159±115 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone: NNK), 133±75.3 (N'-nitrosoanatabine: NAT), and 149±77.1% (N'-nitrosoanabasine: NAB). On the other hand, those diluted with AA were moderately reasonable with the values of 92.2±10.4 (NNN), 87.3±5.9 (NNK), 83.8±6.8 (NAT), and 98.4±13.0% (NAB). In case of sampling filters, RRs for four TSNAs captured using CFP were 65.5±9.29 (NNN), 66.56±11.10 (NNK), 63.12±8.18 (NAT), and 61.8±9.86% (NAB). However, those using QW tube were 94.7±7.41 (NNN), 73.83±4.82 (NNK), 93.8±3.09 (NAT), and 89.3±3.23% (NAB). Based on these results, the optimum methods for sampling and analysis of TSNAs can be made when using QW tube and 100 mA AA as sampling filter and extraction solution, respectively. Under this established condition, method detection limit values of NNN, NNK, NAT, and NAB were 7.38, 12.2, 4.51, and 10.0 ng/mL, respectively. Their relative standard deviation values, when estimated for the reproducibility of analysis, were less than 10% at standard concentration level of 10 ng/mL.

This research was supported by a grant (14182MFDS977) from the Ministry of Food and Drug Safety in 2017.

대학원생 구두 발표 II

GTⅡ-1

Development of anion-exchange membrane with highly cross-linking and large size ion-channel for non-aqueous vanadium redox flow battery

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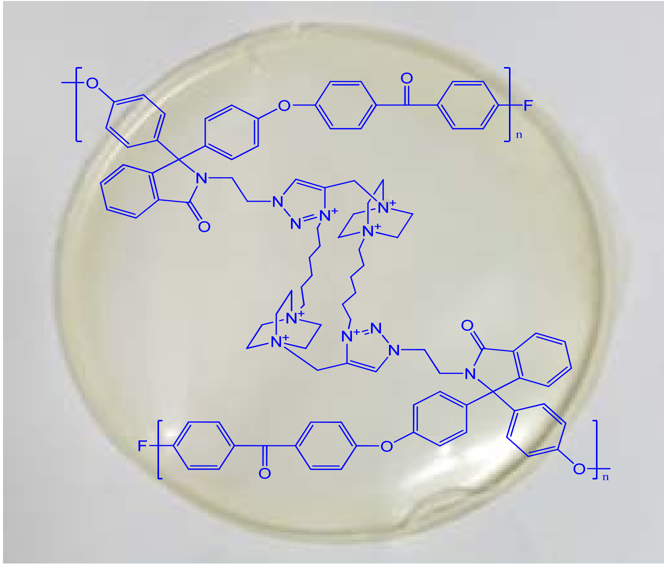
The non-aqueous vanadium redox flow battery (NVRFB) has the advantage of being able at a higher cell voltage, and wider temperature than the aqueous vanadium redox flow battery (VRFB). However, the development of NVRFB is still in its early stages of research and remains a challenge to be solved before it can be successfully applied to practical applications. One of the challenges is the ion exchange membrane, a key element in determining the energy efficiency of battery. Ion exchange membranes in NVRFB systems are mainly anion-exchange membranes to prevent permeability of metal cationic active species and serve to conduct BF_4^- or PF_6^- ions. However, due to the size of BF_4^- or PF_6^- ions, ionic conductivity is low because of ion size, which limits battery efficiency. Therefore, the novel anion-exchange membrane with large size ion channel must for NVRFB be developed in order to commercialize.

In this study, anion-exchange membranes with large size ion channels were synthesized by inducing high ionic aggregation by introducing crosslinking and ion exchanger simultaneously. This anion-exchange membrane backbone is cardo poly(arylene ether ketone) (PAEK) which is synthesized through copoly condensation. The large size ionic channel was introduced onto PAEK via cross-linking reaction after click reaction. The synthesized anion-exchange membrane with large size ionic channel was characterized via FT-IR, ^{1}H-NMR, SEM, XPS and thermal properties. The size of ionic channel of the synthesized membranes was characterized via SAXS. The electrochemical properties were also evaluated such as ionic conductivity, ion-exchange capacity etc. in order to use the NVRFB separator. The performance of NVRFB cell with the synthesized anion-exchange membrane is in progress.



GTⅡ-2

Insights into the sorptive removal of sulfur and volatile organic compounds by a metal organic framework (MOF)

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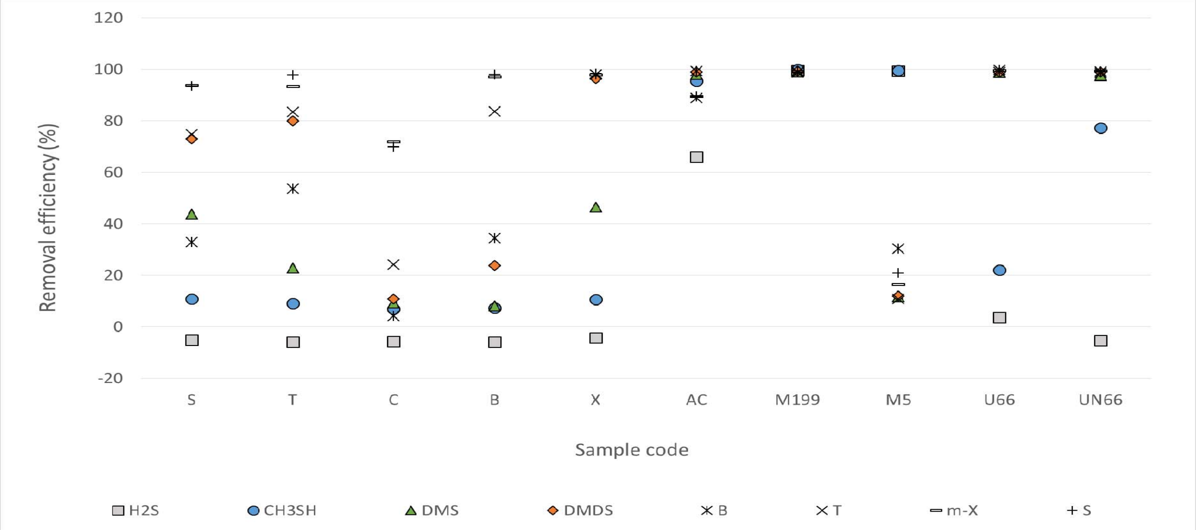
In this research, a list of metal organic frameworks (MOFs: MOF-199, MOF-5, UiO-66, and UiO66-NH_2) were examined to assess their removal capacities for four reduced sulfur compounds (RSCs: hydrogen sulfide (H_2S), methyl mercaptan (MM), dimethyl sulfide (DMS), and dimethyl disulfide (DMDS)) and four aromatic hydrocarbons (benzene, toluene, p-xylene, and styrene). Prior to removal test, the thermal activation (180℃) was carried out in nitrogen flow to activate the prepared MOFs. Our experimental results were comparable to simulation analysis in which target compounds were bound most strongly to MOF-199. In case of MOF-5, the removal efficiency of lighter molecular weight compounds (hydrogen sulfide and methyl mercaptan) was found to be high compared to heavier ones. On the other hand, UiO66-NH_2 showed high removal efficiency for all components except hydrogen sulfide. Further, the performance of selected MOFs was compared against six well-known commercial sorbents (Silica gel, Tenax TA, Carbopack C, Carbopack B, Carbopack X, and Activated carbon) under the same conditions. The estimated equilibrium adsorption capacity ($ng.mg^{-1}$) for the all target compounds was in the order of; MOF-199 (25.4) > Activated carbon (23.6) > UiO66-NH_2 (23.4) > UiO66 (22.5) > Carbopack X (20.5) > Tenax TA (17.0) > Silica gel (16.2) > Carbopack B (14.0) > Carbopack C (7.93) > MOF-5 (7.23). This result supports that MOFs can be a potential sorbent to capture the gaseous hazardous pollutants.



GTⅡ-3

Surface plasmon- resonance analysis for the interaction between human sweet taste receptors and sweeteners

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Among the five human sensory systems, the taste sensory system is involved in determination or selection of food for promoting nutrient intake or avoiding poison. Out of the five basic tastes, sweet taste might have helped us to identify carbohydrate-rich foods and to ensure energy intake. The perception of sweet taste is induced by interaction of sweeteners and specific sweet taste receptor T1R2-T1R3 in taste cells. Three-dimensional structure of the human sweet taste receptor T1R2-T1R3, which belongs to G-Protein Coupled Receptor Class C, has not been identified yet. In this study, we have measured interactions between T1R2-T1R3 and various sweeteners by surface plasmon resonance (SPR). To observe the real-time interactions between the sweeteners and sweet taste receptor, SPR analysis was performed with a Biacore T100 system equipped with an in-line degasser and thermostat at 25 °C. Gold binding polypeptide (GBP) has been used when attaching the receptor to a bare gold chip. Before the addition of ligands, a SPR gold chip was attached to a sensor chip port and priming with 1X PBS at least three times on the average. Then, the equilibration was conducted with the same buffer for 5 min at a rate of 3 μl/min. 25 μg/ml of the receptor was added to immobilize on the surface of a chip and the sensor chip was flushed with 1X PBS. After immobilization of the ligand (receptor), analyte (sweetener) was injected into the microflow cell. The analytes were prepared by diluting to five different concentrations. From the SPR analysis, the dissociation constants between sweet-taste receptor T1R2-T1R3 and sweeteners were determined and analyzed the relationship between dissociation constants and sweetness by sensory analysis. These results suggest that the sweetness of sweeteners is inversely proportional to their dissociation constant. Furthermore, low association and dissociation rate constant of the brazzein can be a reason for its delayed taste and aftertaste.

GTⅡ-4

Synthesis and application of polyphenylene conductive polymers as electron-transfer mediator

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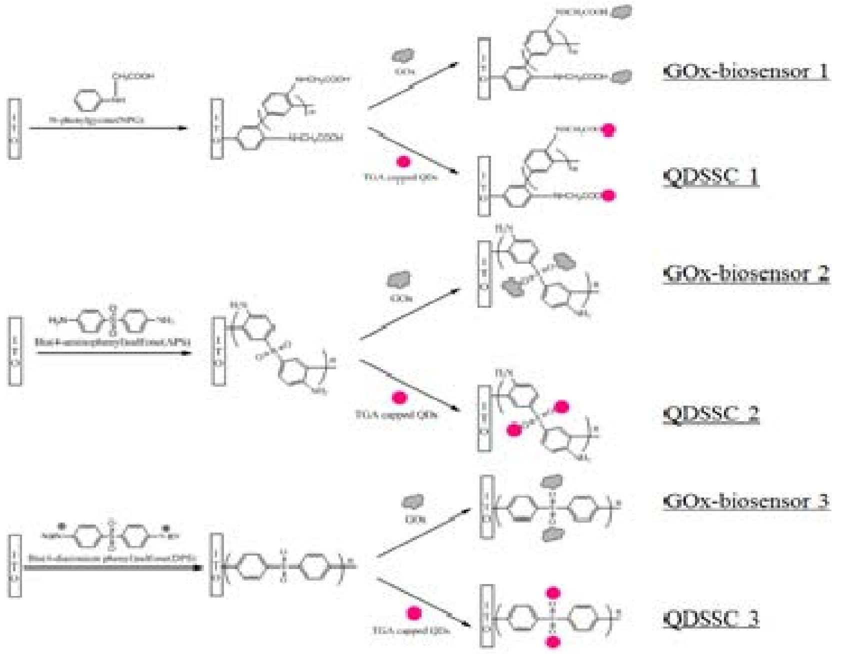
The introduction of an electron-transfer mediator, a suitable interfacial material, plays an important role in improving device performance by optimizing electronic properties. Studies of these electron transfer mediators have received constant attention. Currently used electron transfer mediator include metal oxides and organic polymers. Studies on metal oxides have been actively conducted, but studies on electron transfer mediators for organic polymers have been inadequate. However, polyphenylene, which is an organic polymer, has a conjugation bond and has excellent strength in electron transfer.

In this study, we synthesized the novel the functionalized polyphenylene with a carboxylic acid group (-COOH) and hydroxyl group (-OH), respectively, onto the surface ITO glass electrode by electrochemical polymerization in order to use electron transfer mediator. The prepared conductive polymer grafted electrode were characterized via SEM, UV, IR, AFM, contact angle, and XPS, respectively, in order to know successfully preparation. After then, we used the polyphenylene-grafted electrode as biosensor electrode and photoanode in solar cell. In biosensor electrode, we evaluated the sensing range, sensing limit, response time, and stability. In solar cell, we also evaluated the solar efficiency using solar simulator.



GTⅡ-5

Removal efficiency of reduced sulfur compounds (RSCs) in relation to the mass of the adsorbents

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The removal efficiency of reduced sulfur compounds (RSCs: hydrogen sulfide (H_2S), methyl mercaptan (MM), dimethyl sulfide (DMS), dimethyl disulfide (DMDS)) by different types of sorbents (including Carbopack X, activated carbon (AC), MOF-5, and UIO-66-NH_2) was investigated in relation to changes in their mass (e.g., 1, 5, and 10 mg). The removal performance was then tested using 100 ppb RSCs working standard (WS) at a flow rate of 50 mL/min for 2 minutes by passing this standard across the quartz tube packed with sorbents described above.

Accordingly, MOF-199 showed the highest removal efficiency under all experimental conditions (e.g., regardless of the adsorbent mass and RSCs types). In contrast, removal patterns of other sorbents were greatly distinguished. For instance, the removal efficiency of MOF-5 was proportional to the adsorbent mass in light RSCs (H_2S and MM), while that of Carbopack X was for heavy RSCs (DMS and DMDS). Although removal efficiency of AC was not directly proportional to the adsorbent mass, it generally exhibited a high removal efficiency (>50 %), regardless of the compound type. The removal efficiency of UIO-66-NH_2 also exhibited increases in proportion to the adsorbent mass for all RSCs while such pattern was no long apparent with H_2S. The removal efficiency of sulfur (S) gases hence varied considerably between most adsorbents investigated in this work. Nonetheless, it was found consistently that MOF-199 exhibited the maximum efficiency in adsorptive removal of S gases, regardless of variables considered in this work (adsorbent type, mass, target S gas, etc).

Shedding new light on the fundamental mechanisms by which styrene-butadiene-styrene (SBS) affects asphalt binder performance

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This study sheds new light on the fundamental mechanisms by which polymers affect bitumen performance. Two asphalt binders, namely AP-5 asphalt and solvent deasphalting (SDA) pitch, were mixed with different contents of styrene-butadiene-styrene (SBS) triblock copolymer (e.g., 0, 4, 8, and 12 wt. %). The structure, properties, and performance of unmodified and SBS-modified asphalts were investigated by using different techniques such as elemental analysis, TLC-FID (thin layer chromatography-flame ionization detection), FT-IR (Fourier transform-infrared spectroscopy), NMR (nuclear magnetic resonance spectroscopy), SEM (scanning electron microscopy), XRD (X-ray diffraction), TGA (thermogravimetric analysis), DSC (differential scanning calorimetry), and softening point, penetration, viscosity, and ductility tests. Results indicated that the degree of SBS modification depends chiefly on SARA (i.e., saturates, aromatics, resins, and asphaltenes) composition and polymer content. If the polymers are molded at greater levels along with high-aromatics SDA pitches, then the mixtures are found to be much more stable than those generated with high-asphaltenes AP-5 asphalts.

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GTⅡ-7

A monitoring study of ultra-fine particles depending on meat cooking methods

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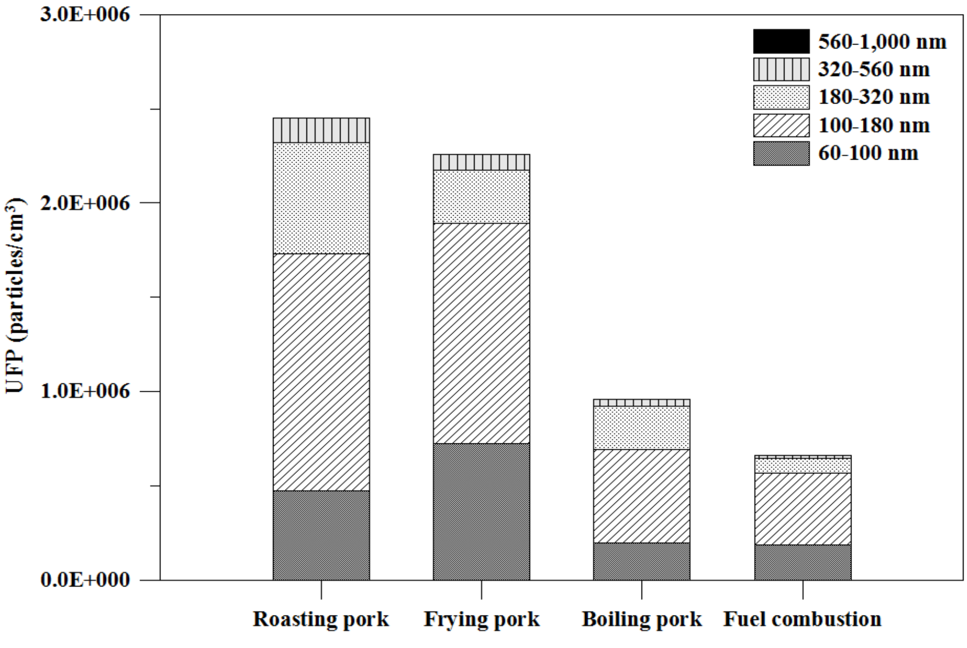
Kitchen is indispensable spaces in our lives. When cooking foods in the kitchen, carbon monoxide caused by incomplete combustion, nitrogen dioxide, particulate matters and other air pollutants are generated. And these pollutants affected directly and indirectly on occupants health who staying indoor spaces. This study was conducted to figure out changes in the number of ultra-fine particles released during cooking process with meat (roasting, frying and boiling) and process without meat. Meat roasting showed the biggest number of ultra-fine particles accumulated, and it was studied as a comparison group followed by frying, boiling and fuel combustion. Relating to the sizes of particles, particles with a size of 100 to 180 nm were occupied the largest proportion, and particles with a size of 560 nm or over were occupied the lowest proportion meat. Frying had the biggest number of particles with a size of 100 nm or below, and meat boiling had no significant difference with fuel combustion without meat. With regard to number concentration of particles accumulated for an hour, concentration of particles with a size of 180 nm or below rapidly increased for the first 10 minutes, that of particles with a size of 180 nm or above increased after 35 minutes in meat roasting process. The number of particles was gradually increased as time goes on in meat frying and boiling process. On the contrary, there were no significant changes in the number of particles in cooking process without meat.



GT Ⅱ-8

Ultra-sensitive immunotargeting of tumor necrosis factor-alpha based on plasmonic single nanoparticle by one shot dual-code 3D enhanced dark-field super-resolution microscopy

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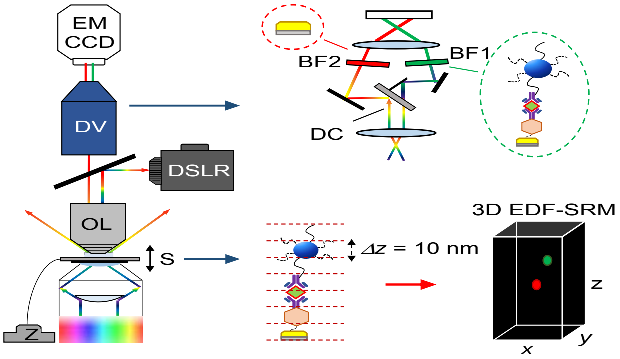
A ultra-sensitive immunotargeting of TNF-α has been developed by three-dimensional (3D) enhanced dark-field super-resolution microscopy (EDF-SRM) based on one shot dual-code plasmonic nanosensing. One shot dual-code EDF-based 3D SRM improved a localization precision and sensitivity with a least-cubic algorithm which provides accurate position of the immunotargeted site. For simultaneously dual confirmable quantitative and qualitative immunoscreening based on the enhanced dark-field scattering images, dual-view and digital single lens reflex camera device were used. Two different sizes of silver nanoparticles (40- and 80-nm AgNPs) were compared to scattering signal of the immunotargeted plasmonic nanoprobe for the 3D EDF-SRM system. The standard TNF-α was immunotargeted at single-molecule level and quantitatively analyized by measuring the scattering signals of 80-nm AgNP on gold-nanostages (GNSs) with 100-nm spot diameters. Applied the least-cubic algorithm, the localization precision in the 80-nm AgNP immunotag on the GNS narrowed to ~9.5 nm. The developed nanosensor exhibited with detection limit of 65 zM (1.14 ag/mL; $S/N = 3$) with a wide dynamic detection range of 65 zM−2.08 pM (1.14 ag/mL−36.4 pg/mL; $R = 0.9921$), which was 20−33,400,000 times lower than previous methods. In addition, recovery was greater than 98% with the spiking of standard TNF-α in human serum samples. This method should be facilitated simultaneous improvement of the immunotargeting precision and ultra-sensitive detection of disease-related various target protein molecules at single-molecule level for early diagnosis of life threatening diseases.



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포스터 발표

PT-001 [원자력/방사선]

Treatment of washing solution of uranium-contaminated soil

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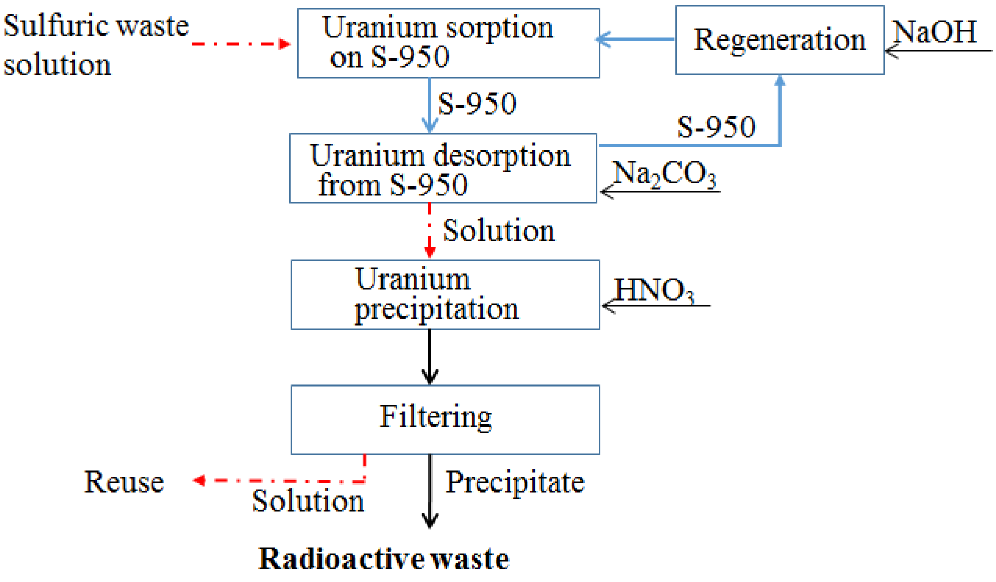
A decontamination method of uranium-contaminated soil by using an electrokinetic equipment after acidic washing had been developed to reduce waste volume [1]. However, when the waste solution was adjusted to near pH 9 to precipitate uranyl ions, a great amount of the 2nd radioactive waste was generated by precipitates of the dominant metals such as iron, aluminum, etc. Therefore, selective removal methods of uranium from the sulfuric acidic washing solution have been studied by using ion exchange resins and a solvent extraction method. When an ampholyte resin (S-950) was added in the waste solution, the uranyl ions in the sulfuric washing solution were selectively removed with a high efficiency, and they were desorbed from S-950 by a 0.5 M Na_2CO_3 solution at 60℃. The used resin was regenerated through a brief washing with a 0.1 M NaOH solution. However, unlike the treatment of uranium ore leaching solutions, the uranium ions dissolved in the soil washing solution were not extracted by alamine 336 [2] and were not sorbed onto the strong anion exchanger [3].



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PT-002 ［원자력/방사선］

Evaluation of metallic fuel rodlets for irradiation testing in the BOR-60 fast reactor

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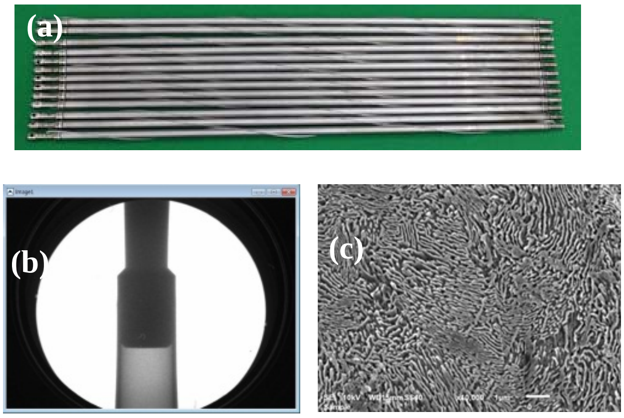
Metallic fuel is a fuel form proposed as a startup fuel for a Prototype Generation-IV Sodium-cooled Fast Reactor (PGSFR) in Korea [1, 2]. In this study, U–Zr and U–Zr–RE (RE: Rare-earth Element; Nd, Ce, Pr, and La) fuel rodlets, which were planned to be irradiated in the BOR-60 research reactor in order to evaluate the irradiation performance of metallic fuel and validate the in-reactor behavior, were prepared through determined fabrication processes. Injection casting technology [3] was applied to produce U–10Zr fuel slugs and the prepared U–Zr and U–Zr–RE slugs were examined with regard to the provisionally determined specifications for a PGSFR. The cross-sectional morphology of the fuel slug was observed using a scanning electron microscope (SEM) with energy dispersive X-ray spectroscopy (EDS). Chemical analyses were carried out to confirm the compositions of the fuel slug and impurities were analyzed using inductively coupled plasma atomic emission spectrometry (ICP-AES). Sodium melt and a bonding process were conducted to bond a fuel slug to the fuel cladding. Quality inspections such as sodium defects, sodium level, and the slug position within the cladding were conducted using X-ray radiography. To seal the end plug to the fuel cladding tube, a Gas Tungsten Arc Welding (GTAW) technique was adopted and the weld quality of the end plug welding was evaluated according to the qualification test plan. Based on the results of this study, it was confirmed that PGSFR fuel rodlets for irradiation testing in the BOR-60 reactor have been soundly prepared.



(a) Prepared metallic fuel rodlets for irradiation test, (b) X-ray radiography analysis, and (c) Microstructure of metallic fuel slug (U–10wt%Zr)

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PT-003 [원자력/방사선]

Annual usage of feed water and electric power of HANARO research reactor

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For operating the nuclear reactor, cooling water and electric power are very important resources. Normally, the commercial nuclear power plants are built near the seashore to easily get the cooling water from the sea water. The HANARO is the only multi-purpose research reactor, it was built urban area in Daejeon. Although the HANARO is research reactor, it is also nuclear reactor. So it needs the huge amount of water for reactor cooling, fire-fighting, washing the test irradiated materials etc.[1]. And electric power also needs to operate the reactor components like pumps, cooling fans which are very important parts to cool-down the reactor. These can get from the city water and Daeduck substation.
Costs were incurred for the use of water and electricity. So water and electricity usage is the main factor to manage the HANARO. This paper analyzes the annual usage of feed water and electricity from 2012 to 2016 in HANARO (High Advanced Neutron-flux Application Research reactor) to know the basic requirement and prevents useless spending.

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PT-004 [원자력/방사선]

Improvement of uranium ion signal intensity of thermal ionization mass spectrometry by graphite deposition

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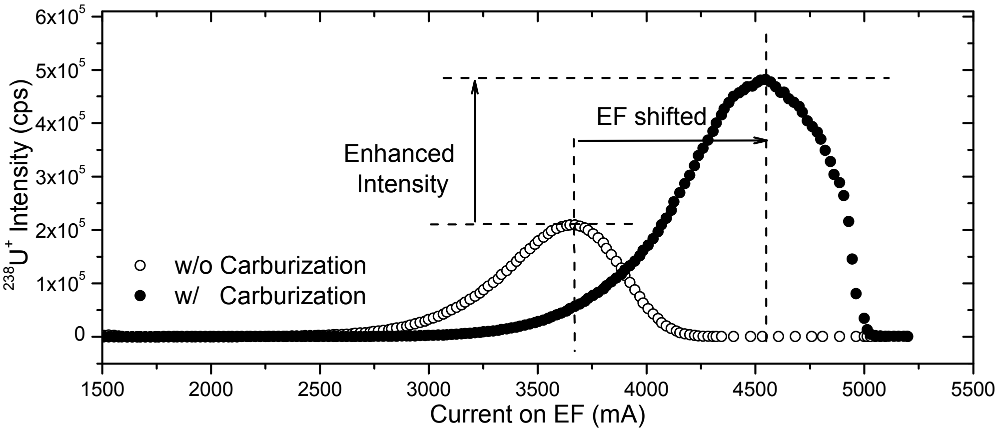
Improvement of uranium ion signal intensity in thermal ionization mass spectrometry (TIMS) is important for accurate and precise isotopic measurement for nuclear safeguards purpose [1]. A feasibility study on the carburization of uranium samples to enhance TIMS sensitivity is presented. Graphite powder in a suspension form was deposited onto rhenium filaments at a high temperature. The uranium ion ($^{238}U^{+}$) intensity of TIMS was monitored to investigate the effect of carburization using graphite powder, as well as the evaporation behaviour and ionization of uranium under carburized conditions, and the dependence of such behaviour on graphite deposition concentrations. Preliminary isotopic analysis of uranium at ultra-trace concentrations agreed with certified values, demonstrating the feasibility of our proposed technique. Further experimental study is required to investigate carburization using graphite powder.



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PT-005 [원자력/방사선]

Determination of the neodymium isotopic ratios for a spent nuclear fuel with samarium impurity by thermal ionization mass spectrometry

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The determination of neodymium isotopic ratios without the interference of samarium isobar was examined when samarium was as the impurity in neodymium solution separated from uranium and the other fission products in a spent nuclear fuel. For determination of neodymium isotopic ratios, we used a thermal ionization mass spectrometer (model: TRITON, Thermo Fisher Scientific co., Germany) with some Faraday cups and double rhenium filament. A sample was neodymium solution separated from uranium and the other fission products of a spent nuclear fuel using an anion exchange column. Neodymium isotopic ratios were determined at a current increased speed of 50 mA/min of an evaporation filament. As a result, samarium began to evaporate prior to neodymium; however, at a current increased speed of 50 mA/min, neodymium also began to evaporate before samarium was completely exhausted. Though, we could obtain neodymium isotopic ratios by minimization of the interference of samarium isobars for the range that only neodymium was detected after samarium was exhausted.

PT-006 [원자력/방사선]

Determination of Pu-241 of femtogram level without separation of Am-241 by thermal ionization mass spectrometry

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For the determination of Pu-241 isotope of femtogram level for a radioactive sample, the effect of Am-241 isotope in the sample was examined. Thermal ionization mass spectrometer (TIMS, TRITON model, Thermo Fisher Scientific co., Germany) with a secondary electron multiplier (SEM) was used for measurement of plutonium and americium isotopes. A sample for measurement was prepared for pictogram level Pu (femtogram level Pu-241) by dilution of Pu reference sample of REIMEP 16A that it included Am-241 produced by the decay of Pu-241. As a result, Pu-241 isotope was determined successfully without the effect of Am-241 because plutonium began to evaporate after americium was completely exhausted.

PT-007 [원자력/방사선]

Preliminary study on implantation of hydrogen ion into SUS 316L and It’s depth profiles

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Austenitic stainless steels with excellent properties such as ductility, corrosion resistance and weldability have been widely used in structures of nuclear reactor [1]. However, hydrogen gas generated by the decomposition of coolant due to high temperature and high pressure inside the reactor may be injected into the reactor structure. As a result, the hydrogen embrittlement occurs, and the implanted hydrogen combines with each other to cause bubbling, swelling, and finally exfoliation of stainless steel. Therefore, it is very important to analyze the total quantity and depth distribution of hydrogen for the use and maintenance of stainless steel. In this study, the implantation features of hydrogen ions into the stainless steel were investigated. Hydrogen ions were implanted into SUS 316L by using an ion implanter at ARTI(Advanced Radiation Technology Institute). To verify the depth profile and damage profiles of hydrogen ion implantation, computer simulations were performed using a TRIM code. The depth profiles of hydrogen ions were confirmed by SIMS(Secondary Ion Mass Spectroscopy) and the SUS 304 and 316L surface changes were observed using SEM(Scanning Electron Microscope) before and after hydrogen ion implantation.

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Preparation for implementation of k0 standardization method in INAA

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To overcome the disadvantages of relative standardization method in instrumental neutron activation analysis (INAA), the k0 standardization method was finally developed and distributed to various laboratories in the late 1970s [1]. Since then, the freeware k0-IAEA Program has been launched by the International Atomic Energy Agency (IAEA), and it has been used to implement k0 standardization method in neutron activation analysis (NAA) laboratories owing to its proven accuracy [2]. The execution of the k0-IAEA program can be divided into five steps. The first step is to edit the permanent database by entering the detector, certificates of the reference materials including the certified activities of the calibration sources, the irradiation facilities, sample capsule and material composition. The second step is to calibrate the detector. The third step is to calibrate the efficiency of detector. The fourth step is to characterize the irradiation facilities and the fifth step is to analyze samples and report them. At the NAA laboratory in the Korea Atomic Energy Research Institute (KAERI), the implementation of k0 standardization method is being conducted but the fourth step is blocked because of the seismic reinforcement construction for HANARO research reactor. However, the implementation of k0-IAEA program requires many steps before characterizing the irradiation facility. Edition of the permanent data should be performed first, and especially the efficiency calibration is an important step to achieve accurate results because it establishes the relationship between the peak energy and the probability of the detector recording a count in the full energy peak. The k0-IAEA program has the capability for the determination of peak position in a spectrum, performs energy calibration and plots energy calibration curves and determination of peak width (FWHM) and efficiency calibration curve. To calibrate the detector, the multi-nuclide and Cs-137 standard source were measured at an 82 mm source-detector distance for 70000 seconds, and a series database was created with measured gamma energy spectrum. Then, Cs-137 spectrum was employed to determine the peak-to-total curve. Knowing the peak-to-total ratio, the efficiency curve was fitted using once again multi-nuclide standard source spectrum. The efficiency and peak-to-total curves for the HPGe detector at the reference position were obtained, and the deviations between the fitted values and measured values were satisfactory. The HPGe detector was successfully calibrated by the k0-IAEA program, and this results will be used for the implementation of k0 standardization method.

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PT-009 [원자력/방사선]

Design of an analysis algorithm for detecting all fake gold bar candidates using PGAA

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As gold prices have been rapidly increasing recently, counterfeit gold bars have been frequently detected. The most recent cases of counterfeit gold bar were detected in Korea in October 2013 and March 2014. These gold bars were brass bars coated with gold and were in distribution at that time. Counterfeit gold bars using brass are easily identified due to the weight difference between gold-plated brass bars and pure gold bars; however, these counterfeit bars were mostly made using tungsten in other countries. Since the density difference between gold and tungsten is just 0.26%, it is impossible to detect counterfeit gold bars simply by appearance or weight. Internationally, the technology to detect counterfeit gold bars using completely non-destructive methods is inadequate just as a starting point. PGAA (Prompt Gamma Activation Analysis) enables the analysis of impurities contained in gold without damaging gold bars including cutting or tearing gold bars that has been suspected as being counterfeit. PGAA qualitatively and quantitatively analyzes the components using prompt gamma generated when stable nuclei are excited to instability and then re-stabilized. The Neutron Activation Analysis & Research Team at the Korea Atomic Energy Research Institute has a PGAA (Prompt Gamma Activation Analysis) INAA (Instrumental Neutron Activation Analysis) system that uses the HANARO research reactor [1]. CN-PGAA (Cold Neutron Prompt Gamma Activation Analysis) using a cold neutron beam that is drawn from the cold neutron sources of HANARO and transferred to a CGB2 neutron guide can provide higher neutron flux and reaction sensitivity than existing thermal neutron sources and can be used for detecting counterfeit gold due to the advantages of the high quality beam. Since HANARO has ceased operation as of 2017 due to maintenance work for supplementing the external wall, the prior research was executed using the Monte Carlo Simulation as an alternative. The research verified the possibility of detecting counterfeit gold bars using the neutron transmission factor and difference of prompt gamma generated from the reactor neutron activation [2]. But a systematic analysis process is needed to minimize the activation of gold bar. The level of activation is related with safety and the period of time that the activated gold bar sample is re-stabilized. At present, an analysis algorithm is designed to detect all fake gold bar candidates. This algorithm represents the analysis process including the measurement of neutron transmission factor, PGAA, nuclear data matching for elements of fake gold bar and so on. Through this systematic process, the counterfeit gold bars can be detected most effectively. After the analysis algorithm is verified through further experiment, it can be used as a quality certification method in the actual gold spot market.

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PT-010 [원자력/방사선]

An analysis of liquid radioactive waste in HANARO (2006~2016)

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The HANARO is multipurpose research reactor that has been operated for 22 years since 1995. During this period, a lot of the radioactive waste disposed in HANARO. Liquid radioactive waste is collected in either a hot shower sump or a reactor sump separately. The hot shower sump is a storage tank for extremely low-level liquid waste discharged from sources such as showers, hand-washing after radiation work. Whereas, reactor sump collects all of liquid radioactive waste from leakage of primary cooling system, wastewater from the washing of fresh nuclear fuel and equipment or exchanging of Ion resin and filter at primary and spent fuel purification system, etc.[1]
If the level of liquid waste in the sumps reaches 1.1m, measurement of the radioactive concentration is required. Liquid waste which meets disposal management criteria (low-level: 3.7x106Bq/*l*, extremely low-level: 185Bq/*l*) can be transferred to the liquid waste disposal facility.[2] This paper describes the status of all liquid radioactive wastes generated by HANARO from 2006 to 2016.

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[2]K.H. Ahn, HANARO Operation Technical Specification, KAERI/TR-3215/2006, KAERI, 2006, p.88-122

PT-011 [원자력/방사선]

Rapid determination of Pu isotopic ratio and concentration using alkali fusion and ICP-MS

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A rapid and accurate analytical method that can be used to evaluate the radioactivity of actinides (e.g., ^{238}U, ^{235}U, ^{239}Pu, and ^{240}Pu) should be developed and validated [1]. In this study, a rapid digestion and separation technique for Pu radionuclides was developed in soil samples. The soil samples were digested using $LiBO_2$ fusion and the target nuclides were extracted through the selective extraction chromatography process using TEVA resin. Finally, Pu isotopes in the aliquot was determined by quadrupole ICP-MS with an APEX nebulizer. For an evaluation of the accuracy and precision of evaluated method, various reference materials (RMs) from IAEA and NIST were analyzed. Based on the analytical results, one may draw conclusions that the evaluated method for Pu isotopes using alkali-fusion, the extraction chromatography process, and ICP-MS measurements is fast and fairly reliable.

Table 1. Analytical results of Pu isotopes in CRM sample

	Experimental values			Reference values value (Bq/kg, Mean & range)				Chemical yield (%)
	^{240}Pu/^{239}Pu	Activity (Bq/kg)						
	Mass ratio	^{239}Pu	^{240}Pu	$^{239+240}$Pu	^{239}Pu	^{240}Pu	ratio	
IAEA-135-1	0.2237	126.5	103.5	213 (205-216)	128.7 (125-135)	101.6 (96.4-112)	0.214 (0.195-0.255)	82.0
IAEA-135-2	0.2075	129.7	98.5					95.9
IAEA-135-3	0.2187	126.1	100.9					92.8
Mean	0.2166	127.4	101.0					90.2

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PT-012 [원자력/방사선]

A study on room temperature adsorption for determination of atmospheric radioactive krypton(^{85}Kr)

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It is well recognized that radioactive krypton(^{85}Kr) is an important evidence of nuclear fuel reprocessing [1]. Typically, cryogenic adsorption method with the activated charcoal absorbent has been used for sampling of the atmospheric ^{85}Kr. However, this method has limitations for remote detection of undeclared nuclear activities due to use of liquid nitrogen as a refrigerant.

In this study, the room-temperature adsorption method for determination of atmospheric ^{85}Kr was preliminary developed to enhance the probability of detection of clandestine nuclear activities and automatic monitoring system. Firstly, 'the minimum required volume (MRV)' of krypton was theoretically calculated. For the calculation, relative measurement uncertainty and minimum detectable concentration (MDC) were used as the criteria. The MRV value was 0.11 cm^3 for the current measurement system. In order to evaluate the efficiency of adsorption system, several cubic meters of air were passed through activated charcoal absorbent under room-temperature condition. For the separation, concentration and determination of krypton, BfS-IAR(budesamt fur strahlenschutz-institute of atmospheric radioactivity) was used.

As a result, the recovered krypton volume was 0.54 ± 0.08 cm^3 in 10 m^3 of air sampled. This amount of krypton from total air sampled volume is corresponded with recovery of 4.8 %. Since the collected amount of krypton is still 4.9 times higher than the MRV, the room-temperature adsorption system could be applied for determination of atmospheric ^{85}Kr determination. Even with 4 m^3 of air, the collected amount of krypton was higher than MRV. In this case, within 18.3 hours radiation counting of ^{85}Kr could be completed with acceptable counting uncertainty limit. Therefore, one may conclude that 24 hours continuous sampling and analysis could be applied with room-temperature adsorption system for determination of ^{85}Kr. In order to conduct 12 hours continuous sampling and analysis, this optimal condition could be modified to air sampling volume of 8 m^3.

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PT-013 [원자력/방사선]

Detection of laser-ionized uranium using sputtered neutral mass spectrometry

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Mass spectrometry is one of the major techniques in the fields of nuclear safeguards and nuclear forensics, providing vastly reliable information such as isotopic composition of nuclear materials. However, the isotopic analysis by mass spectrometry is often suffered from isobaric interferences rendering isotopic data inaccurate [1]. Nuclear safeguards and forensic samples are frequently a mixture of nuclear element of interest and other elements with similar mass ranges, which cause mass interferences. For example, co-presence of ^{238}U and ^{238}Pu or ^{241}Pu and ^{241}Am is prone to interfere with each other and the conventional mass spectrometric techniques are not capable of resolving those elements.

Sputtered neutral mass spectrometry (SNMS) is a relatively new and challenging method, which enables us to selectively detect an element of interest in the presence of isobaric elements with the assistance of resonance laser ionization [2]. In this study, a resonance laser-assisted SNMS (RL-SNMS) system has been built by adopting a gallium liquid metal ion gun, a time-of-flight mass spectrometer and a Ti:Sapphire three laser system. The system still requires optimization in many aspects, but we achieved a small success in the detection of laser-ionized uranium signal. Based on three-color three-photon excitation scheme [3], we first tried to obtain laser-ionized signals by applying a single laser beam (415.51 nm) among the three lasers. By improving laser beam focusing and adjusting pulse timing, we obtained laser-ionized uranium oxide signal with higher yield than secondary ion signal. The comprehensive results will be discussed in the poster presentation.

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PT-014 [원자력/방사선]

Quantitative analysis of uranium concentration in LiCl-KCl-UCl_3 matrix using Laser-Induced Breakdown Spectroscopy

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In terms of several advantages including no pre-treatment of sample and in-situ analysis capability LIBS technique has been developed for on-line remote monitoring of nuclear materials in a high radiation environment [1, 2]. In this study, a quantitative analysis of uranium concentration in LiCl-KCl molten salt, which is used in electrochemical process for recovering uranium from spent nuclear fuel, has been presented using LIBS measurement. The plasma was induced by a Nd:YAG laser(brilliant B) with a 532nm, 10 Hz and 1.6mJ energy per pulse and the mono-chrometer (Monora 500i) with a resolution of 0.045nm, ICCD camera (iStar 320T) were used to take the signal spectrum. A precise distance meter and a motorized translation stage were used to correct the distance between sample and focal lens. It reduced the measurement error due to irregular surface of sample. Calibration samples were prepared by adding UCl3 to LiCl-KCl as a rate of 2, 4, 6, 8, 10 wt%. The calibration curves and the detection limits of the elements were determined using the internal standard method as a ratio of uranium and lithium emission intensities. For better analysis performances, the multivariate calibration using partial least squares regression [3] was employed to take into account for the intensity correlations between the analyte lines and reference signal. The quality of calibration could be improved by multivariate analysis.

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PT-015 [원자력/방사선]

A direct and sequential separation using TEVA and UTEVA for determination of U and Th in solid sample matrix

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NORM(Naturally occurring radioactive materials) exists throughout environment and It is important that the systematic management of natural radionuclides is required as the “Act on protective action guidelines against radiation in the natural environment” was implemented in 2012. The radioactivity in the raw materials, by-products and processed products include natural radionuclides (e.g.,^{235}U, ^{238}U, ^{232}Th) should be directly measured by validated method [1].

In this study, the various CRM samples were used to validate a rapid and sequential method for the determination of U and Th in various solid sample matrix. For the rapid and complete digestion from the samples, a method of alkali fusion was used. The sample solution which added U-232 and Th-229 tracer was directly passed through stacked column with TEVA and UTEVA resin. After separation, the solution which includes U and Th is respectively electro-deposited and measured using an alpha spectrometer. The activity concentration in the CRM sample is calculated based on the recovery rate of the tracer, and the result is compared with the certificate or reference values.

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Dissolution of glass using a hot plate for measurement of nuclide's radioactive activity

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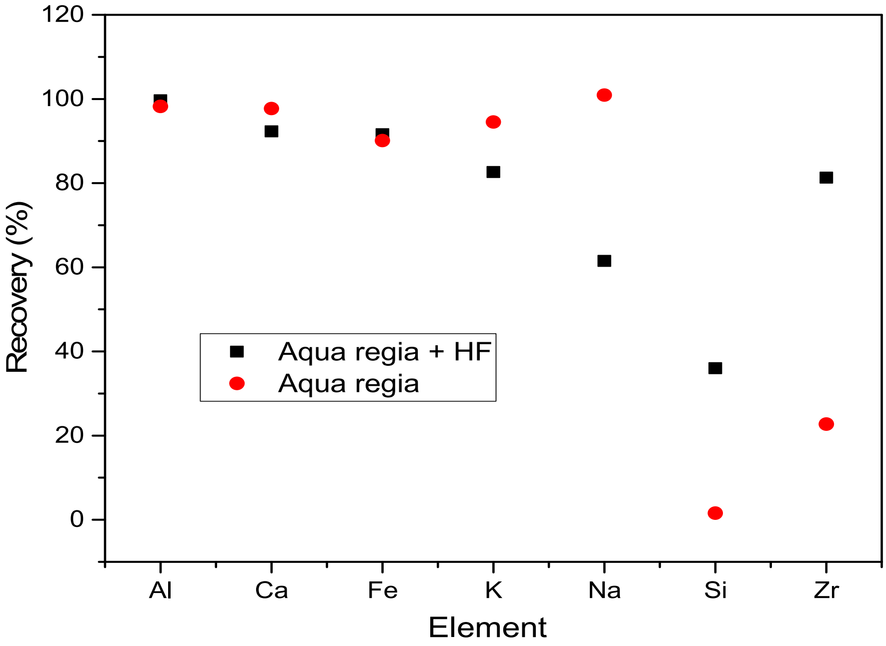
We present a dissolution procedure for the measurement of nuclide's radioactive activity such as ^{60}Co, ^{137}Cs, ^{55}Fe, ^{94}Nb, ^{59,63}Ni, ^{90}Sr, and ^{99}Tc from the vitrification of radioactive waste sample [1]. The bulk sample was grinded using a mill with tungsten carbide balls to increase the surface area of the sample. The powdered inactive glass sample was not dissolved in the mixture of HCl, HNO_3, and HF using a high-performance microwave digestion system (HP-MDS) [2], an ultrawave digestion system, and a hot plate, respectively. However, the undissolved residue was completely dissolved using the second operation of an HP-MDS and ultrawave digestion system in the same mixture of acids. Although the loss of SiO_2 as SiF_4 happened using a hot plate, we selected a hot plate for dissolution of the vitrification of radioactive waste due to handling a lot of samples. It is important to add the right amount of HF for dissolving vitrified intermediate-level waste.



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PT-017 [원자력/방사선]

Precision and accuracy comparison of uranium isotopic analysis using multi-collector system in a TIMS

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The highly accurate and precise isotopic analysis of uranium in ultra trace levels contained in environmental samples plays an important role in monitoring undeclared nuclear activities for nuclear safeguards and nuclear forensics. A thermal ionization mass spectrometer (TIMS) equipped with multi-collector(faraday cups and a secondary-ion-multiplier (SEM)) is one of the best instruments to meet the requirements. This enables us to collect all the infinitesimal ion signals of uranium isotopes (U-234, U-235, U-236, and U-238) simultaneously, which means enhanced precision. A multi-collector system in a TIMS was utilized for isotopic analysis of a uranium certified reference material to compare the precision of measurements of uranium with 100pg, 30pg, and 5pg using dynamic, multi-dynamic, and static detection mode. The substantial enhancement of precision in static measurements showed the excellent applicability of the multi-collector system in TIMS to the environmental sample analysis.

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PT-018 [원자력/방사선]

Physical detection characteristics of irradiated several nuts, sesame and perilla seed with different radiation sources and irradiation doses

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The objective of this study was to investigate the applicability of the photostimulated luminescence (PSL) and thermoluminescence (TL) analyses for 3 peanuts, 1 sesames and 2 perilla seed which are not allowed to be irradiated in Korea. Samples were irradiated at 0.5～5 kGy using a ^{60}Co gamma-ray irraidator and electron beam, respectively. In a view of the PSL results, the photon counts of all the non-irradiated samples showed negative(lower than 700 counts/60 sec). The photon counts of irradiated samples showed positive(higher than 5,000 counts/60 sec). In a view of the TL analysis, results showed that it is possible to apply TL method to all samples. According to the results, PSL and TL methods were successfully applied to detect the irradiated samples(peanut, sesames, perilla). Also, a combined method is recommendable for enhancing the reliability of detection results.

Key word : PSL, TL, nuts, sesame, perilla, gamma-ray, electron beam

PT-019 [원자력/방사선]

Uraium and thorium isotopes analysis in soil

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Natural radionuclides in soil, for examples, Uranium isotopes, Thorium isotopes, Radon, K-40, and radium isotopes, have been interested because of the effects on the public health. Especially uranium and thorium isotopes have been the object of the interest because of major source of radioactivity and daughter radionuclides in soil.

Many methods to measure uranium and thorium isotopes have been used in various research and industrial field. Unfortunately, most of these are very complex, expensive and time consuming, because uranium and thorium isotopes often include in refractory minerals which are very difficult to be dissolved by conventional acid digestion methods, and because most methods require the process of elemental or group separation to eliminate interferences by matrix. These difficulties are also applied on uranium and thorium elemental analysis in soil.

Analysts have been using powerful digestion methods to ensure complete dissolution for quantitative recovery of uranium and thorium in soil and minerals, such as alkali fusion, high pressure bomb, and high pressure microwave digestion etc. However, first method induces high matrix effect by high amount of alkali flux. And the others can generally dissolve only small amount of sample. Isotope measurement instruments by alpha spectrometer and mass spectrometer need chemical purification.

We have tested two digestion methods and traditional chromatographic resin for simple separation method on soil sample for near one gram. In the alkali fusion, we focused on how to reduce matrix effects during the chemical separation process, for example, precipitation methods and conditions for purification. In open vessel microwave digestion, we tested how much uranium and thorium can be recovered. Chromatographic separation method to use traditional anion resin was tested for samples that do not include artificial actinide nuclides. On the base of these results, we will suggest simple and cheap method to analyze uranium and thorium isotope in soil samples.

PT-020 [식품/농학]

Detection of the amphetamine-like substances in dietary supplement by LC-PDA and LC-MS/MS

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Recently, amphetamine-like substances derived from the β-phenylethylamine core structure have been detected in dietary supplements labeled as containing *A. rigidula* [1,2]. BMPEA is an organic compound of the phenylethylamine class and a positional isomer of the drug amphetamine (2-amino-1-phenylpropane). The U. S. Food and Drug Administration determined that BMPEA is not naturally present in food and does not meet the statutory definition of a dietary ingredient [3]. In addition, BMPEA has been classified as a psychotropic drug in South Korea and a doping substance by the World Anti-Doping Agency [4,5]. The aim of this study was to determine whether dietary supplements contained amphetamine and amphetamine-like substance, including β-phenylethylamine (β-PEA) and BMPEA using HPLC-PDA and UPLC-MS/MS. In 10 of 110 samples, illegally added compounds were detected in the following ranges; β-PEA 1.4–122.0 mg/g and BMPEA 4.7–37.6 mg/g. In 3 samples, both β-PEA and BMPEA were detected. We also detected BMPEA in 3 dietary supplements labeled as containing *A. rigidula*. This study will contribute to enhancement of food safety in the South Korea.

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PT-021 [식품/농학]

Validation of indirect determination of MCPD esters and glycidyl esters in edible oils

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Monochloropropanediol (MCPD) esters and glycidyl esters produced in the refining process of edible oils and fats are digested in the body and converted to the free form that is classified as Group 2A/2B carcinogen by the International Agency for Research on Cancer (IARC). Oils and fats contain a large amount of MCPD esters and glycidyl esters, which are known to occur from the heating process at a high temperature during food manufacturing and processing. 3-MCPD ester and glycidyl ester are found in foods processed using oils and fats, and foreign authorities such as JECFA [1] and EFSA [2] have been performing primary monitoring of those substances while there is a general lack of analytical methods and related studies in Korea. This study validated the analytical method to identify MCPD esters and glycidyl esters in edible oils. To determine the total content of MCPD esters and glycidyl esters, this study used the indirect method among the direct method and indirect method. The study compared the contents of analytes with three indirect methods presented by the AOCS [3] Official Method. The analytic method validated by this study could be applied to other food matrices and those data would be used for food safety management on MCPD and glycidol in Korea. This research was supported by a grant (17161MFDS024) from Ministry of Food and Drug Safety in 2017.

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PT-022 [식품/농학]

Improvement of screening method of multi-residue veterinary medicines in livestock by LC-MS/MS

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When veterinary medicines for treatment and pretreatment of animal disease are misuse or abuse, human may ingest livestock products and it gives human body harmful effects [1]. Recently, many countries are developing cost and time effective screening methods to control the residue of veterinary medicines in livestocks.

There is a multi-residue method to detect 74 compounds in the current Korea food code [2]. We have tried to improve the method to add analytes by newly established maximum residue limits(MRL) and to supply scientific bases such as LOQ, and detail condition for determinations for the efficient and rapid analysis.

This method was applied to livestock(beef, pork, chicken, milk, and egg) and confirmed through testing of linearity, accuracy, precision, the limit of detection(LOD), and the limit of quantification(LOQ). Analytes were extracted by 100% ACN (only beef used 80% ACN), purified by C18 powder and hexane (saturated ACN). Then, extract was concentrated using nitrogen evaporator, and filtered by PVDF membrane filter. Finally, analyses were performed by liquid chromatography coupled with tandem mass spectrometry (LC-MS/MS). The LOQ levels of the 102 compounds were lower than their MRLs, and the coefficients of determination(r^2) were over 0.98. The most of recoveries for each compound ranged from 60 – 120%, corresponding to the CODEX guideline to method validation(CAC/GL 71-2009). [3]

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PT-023 [식품/농학]

Development of a multi-residue method for macrolide antibiotics in livestock and fishery products using LC-MS/MS

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Macrolides are one of the most common antibiotic families used as veterinary drug activating to inhibit bacterial protein biosynthesis for food-producing animals [1]. The maximum residue limits(MRL) of these substances have been established in livestock and fishery products by Ministry of food and drug safety(MFDS, Republic of Korea).

However, most of official analytical methods for macrolide antibiotics in Korea food code were single-residue methods. Moreover, the limit of quantification(LOQ) of erythromycin, tilmicosin, and virginiamycin were not established. Therefore, this study was intended to develop a multi-residue method of macrolide antibiotics including erythromycin, josamycin, oleandomycin, tilmicosin, and virginiamycin in livestock and fishery products.

The food samples were extracted with methanol:acetonitrile (25:75, v/v), purified with acetonitrile saturated hexane, and filtered with PVDF membrane filter. In succession, the analytes were qualified and quantified via liquid chromatography-tandem mass spectrometry(LC-MS/MS) in the positive ion mode using multiple reaction monitoring(MRM). Matrix-matched calibration curves were applied with the coefficient of determination(r^2) of 0.99. LOQs for erythromycin and tilmicosin were 1 μg/kg, and 0.5 μg/kg for josamycin, oleandomycin, and virginiamycin. Average recoveries of macrolide antibiotics were ranged from 70 to 110%, with the coefficient of variation(CV, %) less than 15%. All the values were achieved based on the criteria of the Codex guidelines(CAC/GL 71-2009) [2].

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PT-024 [식품/농학]

Development of the analytical method for insecticide tetraniliprole determination in agricultural commodities using LC-MS/MS

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Tetraniliprole is an insecticide of the anthranilamide class, and is particularly activated to inhibit insect ryanodine receptors of coleopteran and Lepidoptera species [1]. The MRL(maximum residue limits) of tetraniliprole will be established by MFDS(Ministry of food and drug safety, Republic of Korea) regulations, and it will be defined only as a parent compound without metabolites. This study was carried out to develop analytical method for the determination of tetraniliprole residues in agricultural commodities. The tetraniliprole residues in samples were extracted by using acetonitrile and partitioned with dichloromethane, and then purified with silica SPE(solid phase extraction) cartridge. Finally, the analyte was quantified and confirmed by LC-MS/MS(liquid chromatograph-tandem mass spectrometer) in negative-ion mode using MRM(multiple reaction monitoring). The linear range of tetraniliprole was 0.001 to 0.1 μg/mL with the coefficient of determination(r^2) of 0.99. The LOQ(limit of quantification) was 0.001 mg/kg. In addition, average recoveries of tetraniliprole ranged from 72.8 to 104.9% at the different concentration levels LOQ, 10LOQ, and 50LOQ, the RSD(relative standard deviation) was less than 9.3%. All results were followed with Codex guideline (CAC/GL 40) and NIFDS(national institute of food and drug safety evaluation) guideline(2016) [2, 3]. This analytical method will be registered for official analytical method in the food code.

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PT-025 [식품/농학]

Development of simultaneous analytical method for determination of imidacloprid and its metabolites in chicken and egg using LC-MS/MS

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Imidacloprid is a chloronicotinyl neonicotinoid compound, a member of systemic insecticide developed in Bayer Crop Science AG. It is a systemic insecticide with through a lamina activity and with good root-systemic action. It regulates nAChR (nicotinic acetyl choline receptors) expression, and exhibited toxicity. Imidacloprid residues in the plant as approximately 40 metabolites, according to Codex regulations, imidacloprid residues have been defined as the sum of imidacloprid and its metabolites containing the 6-chloropyridinyl moiety. Therefore, in MFDS (Ministry of food and drug safety, Republic of Korea) regulations, imidacloprid residues will be defined as the sum of imidacloprid and 6-chloropyridinyl moiety. Thus, a simultaneous analytical method is needed to estimate the residue levels of the parent compound and its metabolites. The objective of this study was to develop and validate on analytical method in chicken and egg samples for the determination of imidacloprid and four metabolites of the 6-chloropyridinyl moiety such as imidacloprid urea, imidacloprid olefin, 5-hydroxy imidacloprid, 6-chloronicotinic acid. Samples were prepared for analysis using a solid phase extraction method. Imidacloprid and its metabolites were extracted from chicken and egg samples with 1% acetic acid in acetonitrile and then purified through C_{18} dispersive solvent. The analytes were quantified and confirmed by liquid chromatograph-tandem mass spectrometer (LC-MS/MS) in positive-ion mode using multiple reaction monitoring (MRM). Matrix matched calibration curves were linear over the calibration ranges (0.005-0.2 μg/mL) for all the analytes into blank extract with coefficient of determination (r^2) > 0.99. For validation purposes, recovery studies will be carried out at three different concentration levels (LOQ, MRL, and 10LOQ) performing five replicates at each level. The proposed analytical method will be used to as an official analytical method in the Korean Food Code.

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PT-026 [식품/농학]

Development of the analytical method for determination of antibiotic streptomycin residues in agricultural products using LC-MS/MS

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Streptomycin is an antibiotic of the aminoglycoside class, and is worked by blocking the ability of 30S ribosomal subunits to make proteins which results in bacterial death. Streptomycin has been known as bacterial diseases inhibitor of certain agricultural commodities such as the fireblight on apple and pear trees. As in medical applications, extensive use can be associated with the development of resistant strains [1][4]. In Republic of Korea, it has been use as an animal medicine and maximum residue limits(MRLs) were established in liverstocks such as cow, chicken, etc(ND-1.0 mg/kg). Streptomycin was used in agricultural products, but MRLs were not established. Therefore, the objective of this study was to develop reliable and sensitive analytical method for determination of streptomycin in agricultural products for ensuring the food safety. This study demonstrated that LC-MS/MS was an accurate and sensitive technique for the determination of streptomycin in agricultural products. And all values were consistent with the criteria ranges requested in the Codex guidelines [2] and Food Safety Evaluation Department guidelines [3].

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PT-027 [식품/농학]

Development of the analytical method for determination of herbicide acetochlor and its metabolites in agricultural commodities using LC-MS/MS

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Acetochlor is a selective herbicide and a member of the chloroacetamide herbicides, and is absorbed mainly by the shoots of germinating plants and to some extent by roots after application. A major metabolic pathway of acetochlor degradation is glutathione conjugation and catabolism to the mercapturic acid with a concomitant loss of the N-ethoxymethyl group. Additionally, base hydrolysis of acetochlor residues to EMA and HEMA moieties in excreta, eggs, and tissues indicates that hydroxylation of the ethyl side chain is another important metabolic pathway for acetochlor. Due to the complex nature of the reside in animals, residue analytical methods have been developed, which determined residues as common moieties substituted anilines designated as EMA and HEMA [1]. Therefore, the objective of this study was to develop reliable and sensitive analytical method for determination of acetochlor residues (EMA + HEMA) in agricultural commodities samples for ensuring the food safety. This study demonstrated that LC-MS/MS was an accurate and sensitive technique for the determination of acetochlor residues in agricultural commodities samples. And all values were consistent with the criteria ranges requested in the Codex guidelines [2] and Food Safety Evaluation Department guidelines [3].

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PT-028 [식품/농학]

Setting of ADI for MRLs establishment of insecticide fluxametamide

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Fluxametamide is currently a new registered insecticide in republic of Korea and an acaricide of the isoxazoline skeleton developed by Nissan Chemical Industries, Ltd.(Japan) in 2007. Fluxametamide has a high insecticidal effect against a wide variety of insect species such as diptera, acarina etc. The mechanism of Fluxametamide is to block the transmission of GABA(Gamma-aminobutyric acid), which inhibits the action of neurotransmitters, disturbing the nerves and bringing the pests to death. In foreign countries like Europe, Japan, and United States, the ADI(acceptable daily intake) and MRLs(maximum residue limits) is not currently established. In case of domestic, Fluxametamide will be newly registered for welsh onion in 2017. So, this study was to review the toxicity data to determine the ADI of Fluxametamide. When oral test is performed to rats, Fluxametamide is most disturbed in abdomen fat after 168 hours. And Radiation-labeled Fluxametamide is excreted mostly in the urine and feces within 48 hours(> 80%) and the main route of excretion is through feces. Oral inhalation and skin inhalation exposure to rats showed moderate or low toxicity. And result of irritation and sensitization tests, caused slight irritation to rat's eyes. As a result of reproductive toxicity test, sexual maturation delay of F_1 and F_2 male rats were observed. Developmental toxicity test showed skeletal abnormality of rat, skeleton of rabbit and intestinal malformation. It was concluded that there was no genotoxicity and carcinogenicity. After reviewing toxicological data, ADI is established to 0.0085 mg/kg bw/day by applying a safety factor 100 to the NOAEL 0.85 mg/kg bw/day derived from observing testis and uterine tumor according to 104 week carcinogenicity test in rats[1]. The results of this study will be used in risk assessment for establishing MRLs for Fluxametamide in food.

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PT-029 [식품/농학]

A new analytical method of β-phenyl ethyl amines in foods and dietary supplements

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PEA (β-phenyl ethyl amine) is a naturally occurring monoamine with psychoactive effects. Orally ingested PEA is primarily metabolized in the small intestine by monoamine oxidase (MAO) before it even reaches the brain. PEA is substituted with alkyl group to become more resistant against MAO. The most widely known alkylated form of PEA is amphetamine (α-methyl PEA) which is pharmaceutically used in the treatment of ADHD, narcolepsy, and obesity. PEA derivatives are illegal to be included in food and dietary supplements since abuse intake of the drugs via food without medical prescription can cause life-threatening side effects. Governmental agencies of food and drug safety invest their efforts to screen out food and dietary supplements illegally containing PEA derivatives. We developed an accurate, simple, rapid and simultaneous analysis method of seven PEA derivatives (synephrine, oxilofrine, PEA, BMPEA, fenfluramine, phentermine and locaserin) in food and dietary supplements using liquid chromatography coupled with photodiode array detection (LC/PDA). The developed method was fully validated and showed good results with respect to specificity, linearity ($r2>0.999$), limit of detection (0.05μg/mL), limit of quantification (0.20μg/mL), precision ($RSD<4.0\%$) and recovery (96-107%). It also satisfied all standards suggested by AOAC. To confirm the detected PEA derivatives, we also developed a qualitative analysis method by Liquid chromatography coupled with tandem mass spectrometry (LC/MS/MS). Seven PEA derivatives were analyzed in 104 food samples purchased in the internet sites. Synephrine was detected in 10 samples; their levels were 3.25-74.79 mg/unit. LC/PDA and LC/MS/MS methods described in this study were simple, rapid and reliable; the methods may be suitable for a rapid and sensitive analysis of seven PEA derivatives in food and dietary supplements.

PT-030 [식품/농학]

Establishment of anlaytical condition for 24 pesticides in livestock products using GC/NPD

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Ministry of food and drug safety makes their effort to screen out contaminated pesticides in commercial agricultural commodities.

The monitoring of pesticides in food is nowadays a major objective in order to get extensive evaluation of food quality and to avoid possible risks to human health.

Therefore, the aims of this study were: to validate simultaneous analytical method of 24 pesticides to investigate the amount in livestock products.

An analytical method for the simultaneous analysis of 24 pesticides in dairy products using GC/NPD has been developed.

Recovery, precision, accuracy, linearity, and limit of quantitation (LOQ) in the analytical method were validated in 5 different matrices(Beef, Pig, Chicken, Egg, Milk).

The recoveries obtained at fortified levels of 0.01~0.5 mg/kg were 60~130% for pesticides, with relative standard deviations (RSDs) of ≤30%.

The proposed method was applied successfully in Korean Food Standards Codex for the residue determination of the 24 pesticide in livestock products.

PT-031 [식품/농학]

Validation of event specific quantitative real-time PCR method for GM alfalfa J101 and J163 in south korea

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In this study, we validated event specific quantitative detection methods for the newly developed genetically modified (GM) crops in order to strengthen the label management for GM foods. Two GM alfalfa events (J101 and J163) were selected for the quantitative detection method. For the validation of a quantitative detection method, real-time polymerase chain reaction (PCR) was conducted. The validation of these methods was tested for accuracy, PCR efficiency, linearity, RSD_r, RSD_R and trueness according to the CODEX guideline. All items showed the PCR efficiency was over 90% and the linearity was more than 0.98. The RSD_R and RSD_r showed below 35% and 25%, respectively. All these results met performance requirements in CODEX guideline. This study may imply that these detection methods can be established for the GMO analysis in South Korea.

PT-032 [식품/농학]

Analytical method development of silymarin for the health functional food

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Silymarin, extracted from the milk thistle plant, has been used widely and is composed mainly of silychristin, silydianin, silybin A, silybin B, isosilybin A and isosilybin B.

The Ministry Food and Drug Safety is amending its test methods for health functional food (dietary food supplement) to establish regulatory standards and specifications. In this regard, we continue to carry out research on analytical method development for the items.

In this study, we have developed a sensitive and selective test method for them by liquid chromatographic-tandem mass spectrometry (LC-MS/MS). It provided high resolution of the individual silymarin constituents on BEH C_{18} column using a gradient mobile phase system comprised of ammonium acetate and methanol/water/formic acid and the assay was fully validated as well.

Our research can provide a scientific evidence to amend the silymarin test method for Health Functional Food Code in Korea.

PT-033 [식품/농학]

Monitoring of 75 veterinary drug residues for fishery products on the Korean market with LC-MS/MS

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Veterinary drugs are widely used to protect or cure diseases in livestock and fishery products and the increased use of these drugs could be potential risks for human and environment. Thus, the national monitoring plans to monitor veterinary drugs and their products should be required to manage these potential risks. In this study, a simple multi-class analysis method using liquid chromatography with tandem mass spectrometry (LC-MS/MS) was used to detect and monitor 75 veterinary drug residues in fishery products. The 196 samples of fishery products including eel, mudroach, flat fish, rockfish, red seabream, rock bream, sea bass, salmon and shrimp were purchased from local markets in Korea. The most frequently detected veterinary drug was enrofloxacin, followed by ciprofloxacin, oxytetracycline, trimethoprim, oxolinic acid and amoxicillin. The detection rate of enrofloxacin was 24.5% (48 samples) and the concentration was ranged from 0.0006 ~ 0.194 mg/kg. The results of this study could help to design the national plan for the next year to monitor veterinary drugs in the fishery products.

PT-034 [식품/농학]

qPCR Based Quantification Method Validation for GM Canola DP073496-4 and MON88302

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Genetically modified (GM) crops have been increased and approved for cultivation and commercialization. Recently, GM Canola DP073496-4 and MON88302 were estimated at the Busan Regional Food and Drug Administration in Korea. To make sure of GMO labeling regulations, GMO identification and quantification methods have been developed and verified by Quantitative Real-time PCR (qPCR). We validated the quantitative methods for detection of GM Canola DP073496-4 and MON88302. To validate the methods, GM or Non GM samples were ground by an electric mill, then DNA extraction and purification were carried out using the Biomerieux's automated NucliSENS® Easymag system. DNA quantity and quality were determined by Nanodrop (Thermo, USA). Then DNA samples containing GM at the mixing levels of 0.08, 0.1, 1.0, 3.0, 5.0 % were prepared and conducted qPCR (Life Technology, USA). The precision of the method was evaluated as the RSD of reproducibility (RSDR) and repeatability (RSDr), linearity (R^2), slope and PCR efficiency. The result from both GM Canola DP073496-4 and MON88302 showed that the values R^2 were more than 0.98 and their RSDR and RSDr were within the range between 15.90% and 20.51%. The trueness, precision and LOQ of the method were at the same levels as those of the previously established Ministry of Food and Drug Safety (MFDS) standard methods.

In conclusion, we validated qPCR based quantification method for GM Canola DP073496-4 and MON88302. The results showed that validated methods would be applicable for the detection and quantification of both GM crops to ensure the appropriateness of food labeling in Korea.

PT-035 [식품/농학]

Pesticide residue monitoring in livestock products by GC-ECD

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Pesticides and their metabolites are of great concern to society as they are harmful to human health. Therefore stricter food safety regulations are being enforced around the world and it is necessary to expand the list of targeted pesticides. To promote consumer safety by excluding the food containing pesticide residues, we investigated the status of pesticide residues of livestock products sold in the market. We analyzed 41 kinds of pesticide residue levels using a multiresidue screening method by GC-ECD. About one hundred samples, 5 commodities (egg, milk, steak, pork and chicken) were collected from 12 major cities across the country. Forty one kinds of pesticides were analyzed using analytical methods for pesticide residue in livestock products. For the validation of methods, the items of recoveries, linearity, limit of detection(LOD) and limit of quantitation(LOQ) were analyzed. In the results, 25 pesticides were recovered in the range of 60~130% at spike levels of 0.05, 0.1 and 0.5 mg/kg with relative standard deviation generally less than 20%. Linearity showed excellent correlation over the study with a correlation coefficient of 0.9911 ~ 0.9999. Average of LOD and LOQ values were 2.1 μg/kg and 8.2 μg/kg respectively. The levels of detected pesticide residues in sample were below the LOQ. Violations of MRLs were not detected in all the samples. The results of this study provided that the safety of livestock products in Korea was managed properly and would be useful to build reliable database of pesticide residues on particular commodities.

PT-036 [식품/농학]

Development and validation of a LC-MS/MS method for determination of spiroxamine residue in food

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In this study, the analytical method for residual spiroxamine was developed. The method was validated by the parameters such as linearity, specificity, limit of detection, limit of quantification, recovery and interlaboratory based on Codex Alimentarius Commission Guideline(CAC/GL 40). The method contains acetonitrile extraction and solid phase clean-up followed by LC-MS/MS analysis. Satisfactory results were obtained for all analytes matrices(hulled rice, mandarin, potato, green pepper and soybean). The recoveries of fortified samples were found to be 70.6~104.6% at spiking levels of 0.001, 0.01 and 0.05 mg/kg. The limit of detection(LOD) and limit of quantification(LOQ) were 0.0005 and 0.001, respectively. The linearity of calibration was $r^2 \geq 0.99$. From these results, this analytical method for spiroxamine residue could be used an analytical method with an acceptable level of sensitivity and repeatability.

PT-037 [식품/농학]

Discrimination of geographical origin of rice by mass spectrometer-based electronic nose

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Rice is one of the staple food in Korea. Increasing imports of foreign rice due to the opening of rice imports, the number of illegal distribution such as false and undefined indication of origin have increased. Although the discrimination of geographical origin is made using DNA analysis of rice varieties, no discriminatory method of origin has been developed covering the same variety of rice, like a Koshihikari and a Hitomebore, cultivated in various countries where Korea, China and Japan.

In this study, we analyzed the patterns of volatile compounds according to geographical origin using Mass Spectrum-based Electronic Nose(MS E-nose) to determine the geographical origin of rice. Using the inside needle dynamic extraction(INDEx) system, which is capable of rapid analysis without pretreatment of samples, we examined the intensity patterns of ion fragments of volatile compounds in 150 domestic and 150 foreign samples(Chinese, Japanese and so on). MS E-nose decomposes volatile components into ion fragments at 70eV and measures the mass spectrum in the range of 10~160amu(atomic mass unit). Among them, multivariate analysis was performed based on ion fragments with high discrimination, and discriminant function analysis(DFA) was performed by pattern analysis. The result from DFA showed that the accuracy of geographical origin discrimination was 97.33% and the correlation coefficient was 0.8621. It was concluded that this technique could be used as a useful method in discriminating the geographical origin between domestic and foreign rice.

PT-038 [식품/농학]

Development of methods to discriminate the geographical origin of rice (*Oryza sativa*) using fourier transformed near-infrared spectroscopy

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Rice(*Oryza sativa)* the staple food of the Korean people, will be imported from 2015 and imports of rice are expected to increase. It is also expected that cases of fraudulent distribution using the difference in prices between domestic produce and imported agricultural products will increase due to the influx of Chinese-made rice most similar to domestic rice to enter into the Korea-China FTA, so that the scientific method for discrimination of origin is needed to be developed. This study aimed to establish the discrimination method of the *O. sativa* origin using FT-NIR (Fourier transform near-infrared spectroscopy) spectral data with multivariate statistical analysis technique. Spectra were acquired at intervals of 16 cm^{-1} at 4,000 cm^{-1} to 11,500 cm^{-1} for a total of 300 samples(Korean domestic 150 and foreign 150). As a result of analyzing the partial least square(PLS) of the multivariate statistical analysis by selecting the optimal wavenumber interval with different absorbance by math treatment with the Standard Normal Variate(SNV), it was found that the accuracy of discriminant equation was 99% even though 1 domestic samples and 1 foreign sample of *O. sativa* were outliers. Based on these results, FT-NIRS would be possible for discrimination of geographical origin between Korean domestic and foreign Rice(*O. sativa*) it is expected that the PLS regression calibration equation can be used to quickly and easily identify the unknown origin rice

PT-039 [식품/농학]

Origin discrimination of carrots using UHPLC-Q-Orbitrap HRMS with multivariate analysis

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A Carrot is a commonly consumed vegetable in Korea. The consumption of carrots in Korea has been increasing and a lot of carrots are imported from some countries. The Most of Korean people prefer to eat Korean carrots. So the price of Korean carrot is 3.7 times higher than imported carrots in Korea. It is why the origin of carrots is identified.

The aim of this study is to discriminate the origin of carrot by comparing organic compounds' contents between Korean and imported carrots using high-performance ultra liquid chromatography coupled to a quadrupole-orbitrap high resolution mass spectrometer (UHPLC-Q-Orbitrap HRMS).

The method based on UHPLC-Q-Orbitrap HRMS was applied to identify compounds' contents difference to discriminate origin of carrots.

The 100 samples from 53 regions were collected and analyzed. Mass scanning range was from 100 m/z to 1,500 m/z. The mass data was acquired at a resolution of 70,000 FWHM(at 200 m/z). Q-Orbitrap HRMS with electrospray ionization(ESI) source was operated in positive mode.

The 29 compounds was identified and compared with relative contents to discriminate origin by searching mass spectral data obtained from Q-Orbitrap HRMS based on mass m/z, retention time, isotopic pattern, and mass spectra.

In this study, we found that identified 29 compounds' contents; glutamine, caffeic acid, acetyl-lysine, acetylglutamine, arginine, 4-hydroxybenzaldehyde, $C_{12}H_{14}N_2O_{10}P_2$, tyrosine, threonine, quinic acid, phloroglucinol, $C_{13}H_9N$, aspartic acid, pyrogultamic acid, pyrogultamic acid, proline, leucine, $C_{13}H_{24}N_2O$, phenylalanine, glutamic acid, $C_{24}H_{42}O_3$, $C_{12}H_{26}O_7$, histidine, glutathione, methyl proline, $C_{16}H_{34}O_3$, $C_{22}H_{23}N_8O_5PS$, $C_{18}H_{33}NO_{13}$, and $C_{21}H_{30}N_7O_8PS$. They were different between Korean and imported carrots. The relative content ratios of the 29 compounds were from 0.6 to 5.5 in Korean and imported carrots.

The accuracy of discrimination origin was 99.0% using 29 compounds' contents data applied with multivariate analysis. Overall, the results showed that this method could be useful in discrimination of the geographical origins between Korean and imported carrots.

PT-040 [식품/농학]

Development of simultaneous multi-residue analysis for 13 growth promoters in field/paddy soil using LC-MS/MS

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Growth promoters are hormones that are one of the veterinary drugs that work in the body of livestock. These are used to increase the production of livestock and to regulate the reproductive period. It is not a problem to apply livestock as a growth-promoting drug standard. However, if a livestock epidemic such as food-and mouth disease and AI occurs and a large amount of livestock is buried in one place, it may remain in the environment in excess of the standard. In particular, the introduction of hormones into the environment can have a negative impact on humans. The purpose of this study was to develop a simultaneous multi-residue analysis for 13 growth promoters in soil using LC-MS/MS for monitoring the residual amount from livestock landfill. The columns used in this study were ZORBAX Eclipse Plus C18(2.1 x 100 mm, 1.8 um, Agilent). As the mobile solvent, water and acetonitrile containing 2 mM formic acid and 2 mM ammonium acetate were used and optimized at a flow rate of 0.4 mL/min. Growth promoters that flow out of livestock landfill are in free form, unlike those existing in the tissues of livestock. Therefore, the pretreatment step can be shortened by omitting the enzyme reaction liberated from the tissue. As a result of the validation, it showed excellent linearity of 0.995 or more in both field and paddy soil, and the recovery rate at low concentration and high concentration satisfied CODEX guideline(60~120%). The coefficient of variation of the recovery experiment was less than 5% and showed excellent precision. The simultaneous multi-residue analysis developed in this study is expected to be able to monitor the residual amount of the growth promoter flowing out from the livestock burial land quickly.

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PT-041 [식품/농학]

Development of analytical method for chromium species separation in agricultural products and soils

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In this study, The development of analytical method for chromium species separation and the study on the transfer pattern to crops. Survey of chromium contamination in total chromium, trivalent chromium, and hexavalent chromium of agricultural products and the same parchment soils. The limit of detection, limit of quantification, linearity, accuracy and precision were 70-110(linearity $R^2>0.995$, RSD<10%) recommended by AOAC Guidelines. The limit of quantification were total chromium 0.83 μg/kg, trivalent chromium 2.18 μg/kg and hexavalent chromium 2.74 μg/kg, indicating that samples of low concentration can be analyzed. The bioconcentration factor(BCF) of chromium were calculated as total chromium, trivalent chromium and hexavalent chromium in agricultural products and soils. The samples with high BCF of total chromium were spinach(0.0984) > young radish(0.0491) > sweet potato(0.0324) and the items with high BCF for the trivalent chromium were in order similar to total chromium in the order of spinach(0.0922) > young radish(0.0462) > sweet potato(0.0300). The top 10 products with high BCF for hexavalent chromium were higher in order of jujube(0.0859) > red pepper(0.0392) > corn(0.0264) > ginger(0.0207). The BCF of each crop can be calculated differently according to the difference of various soil environments. When the crop is selected for the production of safe agricultural products in heavy metal contaminated farmland(abandoned farmland, etc), the BCF results of this study confirm that it is effective to select and cultivate agricultural products with a low degree of transition.

Key words : chromium species, trivalent chromium, hexavalent chromium, BCF

PT-042 [식품/농학]

Establishment of pre-harvest residue limit for pesticides in cow parsnip

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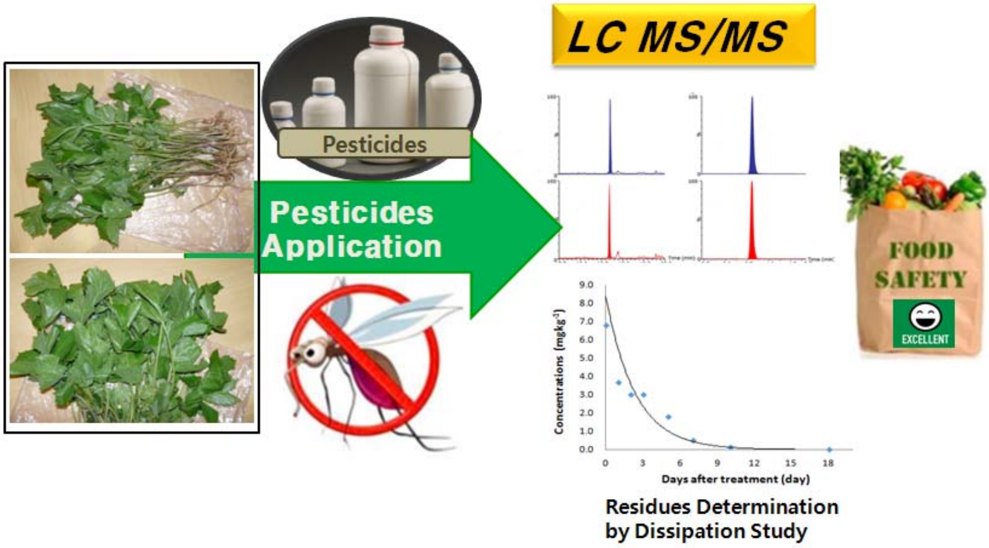
With frequent occurrence of inadequate agricultural products for parts of small land holding result from the absence of permitted pesticides or tolerance limit for pesticide residue, not only economic damage of farmers but also consumer confidence to domestic agricultural products has emerged as a serious problem consistently. In this study, therefore, the residue analysis of pesticides was performed to establish the PHRLs of cow parsnip one of the small land holding and to estimate biological half-lives for 5 kinds of pesticides such as etofenprox, flonicamid, pyrifluquinazone, sulfoxflor, spirotetramat. The cow parsnip samples were collected randomly over 18 days as to 0, 1, 2, 3, 5, 7, 10, 18 days each. The residual pesticides in collected samples were extracted by a QuEChERS method and then analyzed by liquid chromatography-tandem mass spectroscopy (LC-MS/MS). We calculate the decay constant and biological half-life by use of regression equation of each pesticide. Finally, the reliable PHRLs could be determined by tolerance limit for pesticide residue for cow parsnip.



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PT-043 [식품/농학]

Development of HPLC-UV method for the detection and quantification of 30 ginsenoside in processed red ginseng products

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The ginsenoside of red ginseng is known to be caused by the pharmacological effect of red ginseng and the prevention of cancer and the inhibition of growth of cancer cells are increasing interest in red ginseng and red ginseng processed products day by day. Thus, this study purchased various red ginseng processed products to carry out the analysis by medium using various red ginseng processed products (tea, concentrate, fruits preserved in honey, red ginseng, pills etc.), set optimal pretreatment conditions and equipment conditions and conducted the monitoring based on the result. To analyze the ginsenoside of red ginseng, HPLC-UV was used to isolate 30 kinds of ginsenoside. Through the validation of the analysis method, good results such as resolution and reproducibility could be obtained. The development of this simultaneous analysis method is expected to not only be used as a ginsenoside ingredient test for quality control of various red ginseng processed products but also help to secure excellent competitiveness for processed red ginseng products.

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PT-044 [식품/농학]

Discrimination analysis of production year of rice based on mass spectrometer

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The price of rice was reduced by dishonest distribution of rice by mixing of rice produced in different years. Therefore, the purchase price decreased due to the collapse of the market and the farmers were deprived of their will. As a result, there is a great damage to rice farmers and consumers who can not buy good quality rice.

According to the Grain Management Law, grain producers and sellers are prohibited from mixing of rice produced in different years. Therefore, measures are needed to prevent fraudulent distribution of grain and to stabilize rice supply.

Analysis of Production Year of Rice is measured by weighing the weight of one grain of rice, adding distilled water and beads, heating, shaking and centrifuging. Sorbitol which is a sugar alcohol was extracted from the rice sample solution and the content of sorbitol was analyzed through a mass spectrometer.

In January 2017, rice plant samples produced between 2014 and 2016 kept in the government grain store were collected and frozen. After peeling off the husk of rice in March 2017, 20 rice samples were analyzed separately. The sorbitol content of rice produced in 2014 was 296 ~ 920 mg / kg, the sorbitol content of rice produced in 2015 was 15 ~ 54 mg / kg, and the rice produced in 2016 was not less than 0.5 ~ 3.5 mg/kg.

PT-045 [식품/농학]

Determination of matrine and oxymatrine in processed foods by LC-MS/MS

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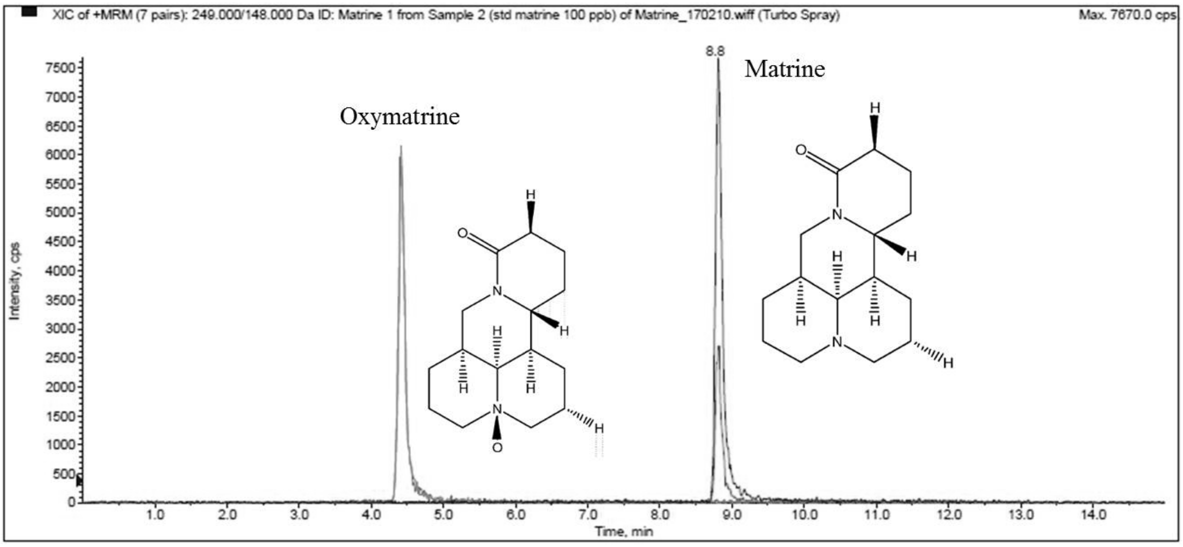
Sophora flavescens is the root of *Sophora flavescens* Solan-der ex Aiton which belongs to Leguminosae family, contains matrine ($C_{15}H_{24}N_2O$: 248.36) and oxymatrine ($C_{15}H_{24}N_2O_2$: 264.36) [1]. Sophora flavescens is used for the treatment of viral hepatitis, gastrointestinal hemorrhage and cancer, while matrine is the one of the alkaloids that can paralysis on the central nervous system [2, 3]. Sophora flavescens is listed as Sophora Root in the Korean Pharmacopoeia but cannot be used as food material according to Korean Food Standards Codex. Unfortunately, some processed foods especially in red ginseng products are adulterated with sophora flavescens because of its bitter taste. Thus, the matrine and oxymatrine in the 66 suspected samples obtained in 2016 in South Korea were determined by LC-MS/MS. The samples were pretreated with SPE (HLB) and analyzed using electrospray ionization in the positive ion mode. The results showed that matrine (m/z 249→150, 148) and oxymatrine (m/z 265→247, 205) were detected in 23 and 10 samples, respectively. These positive samples pose a health threat to consumers. Therefore, processed foods adulterated with sophora flavescens have to be continuously monitored for public health.



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PT-046 [식품/농학]

Optimization of SPME-based sample preparation method for detection of low concentration compound

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Preparation of sample is essential and important step for the correct quantitative analysis of target compounds without interfering with the matrix or other components within the specimen. Solid Phase Extraction (SPE) is a well known and widely used pretreatment method among various pretreatment methods. Solid Phase Microextraction (SPME), mainly used for pretreatment of GC-MS analysis, is increasingly used in LC analysis process. Gibberellin is a plant hormone and contains about 120 compounds, but the quantification of each component is not being performed, only the total amount of them has been measured using a kit. There is a need to optimize an analysis method for the quantification of gibberellin compounds in various plant studies. In this study, the preparation protocol of SPE and SPME for gibberellins was optimized. This optimized protocol can be useful for quantifying phytohormones or metabolites in various plant samples.

PT-047 [식품/농학]

Geographical origin of garlic and onion using multiple isotopes

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Stable isotope analysis has been known as a very useful analytical method for determining the geographical origin of agricultural products, and it is currently widely utilized for distinguishing the geographical origin of various agricultural products [1,2]. In addition, accumulated analytical data is statistically treated to be used for even more efficient identification of geographical origin.

An attempt was made to determine the geographical origin of domestic agricultural products by analyzing the multiple isotopes (carbon, nitrogen, sulfur, and oxygen) in garlic and onions collected directly from the production areas, followed by statistically analyzing all the analytical data together. Our results were successful as geographical origin was correctly determined with 84.69% of garlic samples and 89.18% of onion samples. As for the other samples, however, the geographical origin of samples from a single administrative district was wrongly determined to be various other administrative districts (Geographical origins involved in this research are the following administrative districts: Gangwon-do, Gyeonggi-do, Gyeongsang-do, Jeolla-do and Chungcheong-do). This was interpreted that the statistical method based on multiple isotopes alone could not clearly distinguish product characteristics between adjacent administrative districts. Therefore future research is considered necessary for more accurate geographical origin determination, particularly concerning the combined utilization of the data from this research and other kinds of analytical data (such as obtained using multi-elemental analysis, strontium isotopes, etc.). This kind of technique for geographical origin determination is expected to show higher efficiency especially in distinguishing between products of different nations, such as between domestic and foreign products.

Acknowledgment: This research was supported by the Advanced Production Technology Development Program (Project Number: 316075-04) of the Ministry of Agriculture, Food and Rural Affairs.

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PT-048 [식품/농학]

Rapid characterization of bioactive phenolic and carotenoid derivatives in the fruits of green pepper (*Capsicum annuum L.*) using UPLC-ESI-Q-TOF/MS/MS analysis

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This research was the first to investigate on the simultaneous characterization of metabolites, including phenolic compounds and carotenoids from the fruits of green pepper. Fifteen compositions of single type and three chemical groups were observed within 35 min in the 80 % methanol extract. Among them, the identified nine phenolics were confirmed as N-caffeonylputrescine (**1**), caffeic acid-4-O-β-D-glupyrano-side (**2**), luteolin-6-C-hexosyl-9-C-pentoside (**3**), luteolin-6-C-pentoside-8-C-hexoside (**4**), myricetin (**5**), luteolin-8-C-hexoside (**6**), luteolin-7-O-(2-apiosyl)glucoside (**7**), luteolin-6-C-(6-malonyl)hexoside-8-C-pentoside (**8**), and kaempferol-3-rhamnosyl(1→2)-xylosyl-(1→3)-rhamnosyl-(1→6)-galactoside (**9**) in the negative electrospray ionization mode with molecular weights of 249, 341, 579, 579, 317, 447, 579, 665, and 871, respectively. Carotenoid structures were characterized as capsanthin-C16:0 (**10**) (821), capsanthin 3'-ester (**11**) (821), capsianoside (**12**) (1099), capsianoside I (**13**) (659), capsianoside II (**14**) (1085), and capsianoside G (**15**) (1169). Moreover, the various metabolites of three chemical groups such as quercetin, luteolin, and apigenin structures were observed in the retention times of 12~27 min.

PT-049 [식품/농학]

The research for improving of quantitative test of methyl ρ-hydroxybenzoate as food additives

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Methyl ρ-hydroxybenzoate (Methyl paraben, MP) is a typical food additive which use to enhance preserve of food such as jam, beverage, soy sauce, vinegar and pickle. At present, the quantitative test (assay) of Korean Food Additives official method for MP is still using titration methods which were developed 1970s'. The methods make an error that it doesn't match the actual amount of input because of the method has lower accuracy and precision than instrumental analysis such as using HPLC and GC method. On the other hand, international official FCC method for MP is using HPLC to measure more accurately. The objective of this research is to improve the assay of MP for researcher of food additives by comparison with official methods of Korea and FCC. The assay of Korea for MP was measured by titration with change of color. Validation of assay of FCC were carried out including linearity, limit of detection, limit of quantitation, recovery and precison those were appropriate in international guideline.

Acknowledgement

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PT-050 [식품/농학]

Development of analytical method for artificial Sweeteners in fatty food

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A method for analysis of three artificial sweeteners (aspartame, saccharin, acesulfame potassium) in processed dairy food was developed by using rapid sample pre-treatment and HPLC-PDA(High Performance Liquid Chromatography-Photodiode Array Detector). The experiment was carried out by adding two kinds of food as the previous improved method. In the sample selection, simultaneous analysis of three types of artificial sweeteners was carried out for foods containing a lot of fat. The sample pretreatment is a method of improving the pretreatment process by using the Carrez reagent which removes fat and protein. Ion exchange cartridge was used to capture the sweeteners and to remove residual fats. Separation was performed using reverse phase C18 column (5 um, 4.6 x 250 mm) to establish instrumental analysis conditions. The results showed good results in linearity and recovery. The recovery rate was 90 ~ 110%.

Acknowledgement

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PT-051 [식품/농학]

Analysis of volatile compounds in soy sauce using solid-phase microextraction arrow

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Volatile compounds in soy sauce was separated by solid-phase microextraction-arrow (SPME-arrow) and verified by gas chromatography-mass spectrometry equipped with a 60 m × 0.25 mm i.d. (df = 0.25 μm) DB-WAX bonded-phase fused-silica capillary column. This SPME-arrow was optimized with soy sauce samples under four extraction conditions, phase as a coating for fiber (Polydimethylsiloxane, Polyacrylate, Carbon Wide Range/PDMS, Divinylbenzene/PDMS), extraction temperature (40-60℃), extraction time (10-60 min), and NaCl concentration (0-8%). The volatile extraction from soy sauces was conducted by the optimized extraction methods using SPME arrow; Polyacrylate, Carbon Wide Range/PDMS with soy sauce (1.0 g) for 1 hours at 60℃. The major volatile compounds extracted from soy sauce were ethanol, 3-methyl butanal, 2-ethyl-6-methyl pyrazine, acetic acid, and benzaldehyde. In addition, SPME-arrow analysis was compared for extraction capability with solid-phase microextraction (SPME) method. The results showed that extraction efficiency of SPME-arrow method was much better than SPME method, widely used for volatile analysis in various samples. However, there is no previous work on the volatile compounds in Korean traditional foods using SPME arrow. Moreover, very information on the SPME-arrow analysis in various foods is available today.

PT-052 [식품/농학]

Analysis of volatile compounds in various foods using Headspace Stir Bar Sorptive Extraction (HS-SBSE)

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GC and GC/MS system have applied several extraction methods including solvent extraction, purge-trap or dynamic headspace techniques for the analysis of the volatile compounds in foods. Stir Bar Sorptive Extraction (SBSE) is recently being studied for quick and green techniques of volatile compounds from various foods. Especially, Headspace Stir Bar Sorptive Extraction (HS-SBSE) has also shown to offer the higher recoveries than HS-SPME and has improved the analytical performance in terms of low concentration capacity. In addition, very information on HS-SBSE is available today and studies on the volatile compounds from foods frequently consumed in Korea. In the present study, volatile compounds from Omija (*Schizandra chinensis*) fruits and leaves, Deonjang (fermented soybean paste) and Gochujang (fermented red pepper paste) were isolated by HS-SBSE and identified by gas chromatography-mass spectrometry using an thermal desorption unit (TDU-GC-MS) equipped with 60 m DB-WAX column with 0.25 mm i.d. and 0.25 µm thickness. The HS-SBSE was optimized by following extraction conditions; adsorbent phase as a coating for the stir bar (polydimethylsiloxane and ethylene glycol-silicone), extraction temperature (30-50℃), sample amounts (0.3-0.9 g for Omija fruits and leaves and 0.5-1.0 g for Deonjang and Gochujang), extraction time (30-150 min) and sample preparations before extraction (freeze-dried and raw ground Omija fruits and leaves).

The optimized HS-SBSE for volatile extraction for Omija fruits and leaves were carried out by using ethylene glycol-silicone stir bar with freeze-dried fruits (0.3 g) and leaves (0.4 g) for 2.5-hour at 50℃. For Deonjang and Gochujang, the volatile extraction conditions were described in 0.5g of sample amount, 50℃ of extraction temperature, 2-hour of extraction time and two types of the stir bar (polydimethylsiloxane or ethylene glycol-silicone) were simultaneously used. Moreover, HS-SBSE showed the better extraction capability than HS-SPME, widely used for volatile analysis, due to the large volume of the coating material in the stir bar than that in SPME fibers.

PT-053 [식품/농학]

Rapid and accurate determination of major isoquinoline alkaloids by UPLC-ESI-Q-TOF and its application to extract of medicinal plant

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In this study, we set up an analytical method which is able to rapidly and accurately determine isoquinoline alkaloids from medicinal plants using ultra pressure liquid chromatography electrospray ionization source quadrupole time-of-flight mass spectrometry (UPLC-ESI-Q-TOF). These alkaloids were eluted on a C18 column with 0.1% formic acid and acetonitrile, and separated into a good resolution peak within 13 minutes. Each of the analytes separated was characterized by precursor ions in positive mode and fragment ions produced by collision-induced dissociation (CID), which was used as reliable database. We confirmed that the anlaytes showed excellent linearity (r^2, 0.9971-0.9996), limit of detection (LOD, 5-25 ng/mL), limit of quantification (LOQ, 17-82 ng/mL), accuracy (91.6-97.4%) and precision (1.8-3.2%) of intraday and interday though method validation. As the result for analysis of extract of *Chelidonium majus* L. by set up method, magnoflorine, coptisine, sanguinarine, berberine and palmatine were detected by matching retention time and characteristic fragment ion pattens of reference standard and its content of coptisine was highest. Furthermore, profiling of alkaloids were carried out with fragment ion pattens of peak of unknown components. As the result, protopine, chelidonin, stylopine, dihydroberberine, canadine and nitidine were tentatively identified. Also, we proposed a predicted molecular structure corresponding to MS/MS spectra. We concluded that our suggested method for determination of major isoquinoline alkaloids by UPLC-ESI-Q-TOF will be useful not only for quality control but also for investigation of phytochemical constituents of medicinal plants rapidly and accurately.

PT-054 [식품/농학]

Simultaneous determination of indole alkaloids by UPLC-ESI-Q-TOF and its application to medicinal plant

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Alkaloids are basic compounds that exist as secondary metabolites of plants. Among them, indole alkaloids were reported to exhibit potent physiological activity to human body. Especially, representative indole alkaloids (vincristine, vinblastine, vindolen, reserpine, ajmaline, ajmalicine, serpentine, catharanthine, hirsutine and hirsuteine) are well known to exhibit anticancer and antihyperthensive effects. In this study, we report a new analytical method that can simultaneously determine these alkaloids from medicinal plants by ultra pressure liquid chromatography electro spray ionization source quadrupole time-of-flight mass spectrometry (UPLC-ESI-Q-TOF). The chromatographic separation was performed with 0.1% formic acid and acetonitrile on a C18 column. Each of the analytes was separated into peak with good resolution within 14 minutes. The analytes were characterized by protonated molecular ions [M+H]+ and fragment ions in positive mode by ESI source. We confirmed that the analytes showed good linearity (r^2, 0.9984-0.9999), limit of detection (LOD, 9-90 ng/mL), limit of quantification (LOQ, 28-270 ng/mL). The intraday an interday accuracy were more than 78.1% and precision were between 0.7% and 6.9%. As the result for analysis of extract of *Uncaria sinensis Havil* by the method, hirsuteine and hirsutine were detected by matching retention time, precursor ions and product ions of reference standard and its content were 18-19 ng/g, respectively. In this study, we suggest that this new simultaneous determination will be useful for investigation of indole alkaloids in various medicinal plants.

PT-055 [식품/농학]

The effect of heat treatment on the reduction of MPN(4′-*O*-methylpyridoxine) in *ginkgo biloba* seed

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A vitamin B_6 derivative, MPN(4′-*O*-methylpyridoxine, ginkgotoxin) is responsible for food poisoning by *Ginkgo biloba* seeds. In this study, we investigated content of pyridoxine and MPN in MPN standard solution and *G. biloba* seed extracts with heat treatment in order to evaluate the reduction of toxic component in *G. biloba* seed. Heat treatment condition was conducted at 90-150℃ for 0 min to 60 mins, and all samples were adjusted to the same concentration of 1,000 μg/mL. The MPN content decreased from 973-568 ug/g of MPN standard solution to 359-76 ug/g of *G. biloba* seed extract with increasing the heat treatment time. However, in all the samples, except for the 90℃ heat treatment group, the pyridoxine content in MPN standard solution increased with increasing the heat temperature and time, and the extracts also showed a similar tendency. Therefore, this may have resulted because of the synthesis due to pyrolysis of MPN. From the results of this study, we can expect to improve the utilization of functional food materials by applying suitable heat treatment conditions and decreasing MPN content on the *Ginkgo biloba* seed.

PT-056 [식품/농학]

Effects on Plaque, Calculus Accumulation, and Gingivitis of *Weissella cibaria* CMU in Beagle Dogs having halitosis

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Periodontal disease is the most common single disease of middle aged and aging individuals in dogs. Lactic acid bacteria are known to have a positive effect on prevention of gingivitis and plaque accumulation. Among them, *Weissella cibaria* CMU strain has been shown to inhibit biofilm formation, volatile sulfur compounds (VSC) formation, and growth of periodontal pathogenic bacteria [1]. In this experiment, we evaluated plaque, calculus and gingivitis score of eighteen beagle dogs.

The experimental groups were divided into 5 groups: negative control group, positive control group, CMU-low, medium and high dose groups. Oral administration of CMU was carried out for 6 weeks, daily. And control group received maltodextrin orally instead of CMU. The calculus index, plaque index and gingivitis index were measured at 0, 2, 4, 6, 8, and 10th week after administration.

As a result, gingivitis index did not show differences among the groups. But compared to the last day of the study, the increase in the plaque and calculus index was lower in the CMU group than control group. These results suggest that CMU has potential for periodontal disease prevention in humans and beagle dogs. If the CMU strain is used as a probiotic for the prevention of periodontal disease, it is expected to have a high added value in humans and companion animals.

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PT-057 [식품/농학]

Effects of *Weissella cibaria* on halitosis and oral bacteria in Beagle Dogs

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In companion animals, bad breath causes a significant psychosociological problem in the companion animal–owner relationship. Nowadays, probiotics is used to improve oral malodor in human, because probiotics contain not only gastrointestinal advantages but also oral health improvement[1]. *Weisella* (*W.*) cibaria isolates possess the ability which suppress volatile sulfur compounds (VSCs) production under both *in vitro* and *in vivo* conditions[2]. The objective of this study is to assess improved VSCs and oral bacteria after oral administration of *W. cibaria* CMU in beagles.

The experimental groups were divided into 5 groups: negative control group, positive control group, CMU-low, medium and high dose groups. The oral administration of CMU was carried out for 6 weeks, daily, and control group received maltodextrin orally instead of CMU. The concentrations of VSCs were measured at 0, 2, 4, 6, 8 and 10th week after administration. Oral Chroma^{TM} (Abilit Corp, Osaka, Japan) was used to evaluate the concentrations of VSCs, and we analyzed oral bacteria using the samples which was swabbed in whole oral cavity by Real time PCR.

As a result, The concentrations of total VSCs decreased in CMU administered group significantly. H_2S which is the factor of Total VSCs has not changed after the beginning of this experiment. The concentrations of CH_3SH had a tendency that is similar to Total VSCs, and $(CH_3)_2S$ decreased slightly. In result of oral bacteria analyzation, there were no significant changes between before and after administration of CMU.

In conclusion, *W. cibaria* CMU has an effect on reducing oral malodor overall. This study suggest that CMU are suitable for consideration as a helpful bacteria for humans and companion animals in that decreasing their oral malodor.

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PT-058 [식품/농학]

Various parameters influencing the performance of enzyme linked aptamer assay - especially effect of buffer

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Aptamers are synthetic oligonucleotides which are selected by SELEX (Systematic Evolution of Ligands by EXponential enrichment) as chemical antibodies. They are ssDNA (single-stranded DNA) or RNA with high affinity and selectivity for a certain target. Aptamers have some advantages than antibodies due to the nucleic acid nature and target-induced structure-switching properties [1]. So, aptamers are widely used in many ways. Tetracylines (TCs) are antibiotics used to treat infectious disease and animal husbandry. Humans can intake TCs which remain the drug residue from the food including meat, milk and honey. It is harmful to take contaminated foods and can occur the increase of antibiotic-resistant bacteria [2]. To protect human body, it is necessary to develop a sensitive and quantitative analytical technique for detecting TCs.

In this study, we performed enzyme linked aptamer assay (ELAA) based on hybridization of aptamer for detecting TCs. A 76mer DNA aptamer was utilized as capture binder and 18mer probe of complementary oligonucleotides as detector. When we performed ELAA, considerations are buffer composition, immobilization strategy, incubation time, temperature and etc. Among them, the effect of wash buffer (phosphate, Phosphate containing 0.05% Tween-20, Phosphate Buffered Saline and Phosphate Buffered Saline containing 0.05% Tween-20) was examined, especially. According to concentration of TC, signal gap was observed without Tween-20 and no gap with Tween-20. Tween-20 in wash buffer seems to disturb aptamer-target binding. Thus, various parameters influencing the performance of ELAA were investigated.

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PT-059 [식품/농학]

Advantage sensitivity in enzyme linked aptamer assay with DNA homolog of the RNA tetracycline aptamer

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Aptamer is functional oligonucleotide of single-stranded DNA or RNA which is amenable to chemical synthesis and modification with high purity. It has advantages especially for small molecule assay which has restriction of antibody production having more than two different epitopes recognition due to a few epitopes. Aptamer can recognize and bind to the specific site of target molecules with higher affinity, specificity and selectivity [1]. So, it is a powerful tool for various applications such as drug screening, diagnostics, biosensors and etc. In this study, to detect tetracyclines which are widely used for prevention and control of infectious disease [2], enzyme linked aptamer assay were performed by two different designs: One has performed competitive assay by using DNA homolog of 57mer RNA aptamer. And the other was studied sandwich assay by using two different 76mer DNA aptamers - one is used as a capture binder and the other as a detector.

Due to the lack of hydroxyl group in the 2' position, DNA has more stability, not only chemically but also biologically compared with RNA. So, the use of the DNA homolog of the RNA aptamer can expect to improve the affinity toward target molecule and finally, lower the detection limit [3]. DNA homolog is that the changing to the DNA version of RNA aptamer. Thus, we expect those advantages from these studies. Moreover, enzyme linked aptamer assay can utilize to develop for detection of small molecules like tetracyclines.

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PT-060 [식품/농학]

Oligonucleotide-based enzyme linked aptamer assay for detection of tetracycline in milk samples

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Tetracyclines (TCs) are generally used both in treating human and animal diseases for preventing the growth and spread of bacteria. However, abusing antibiotics can cause increase of resistant bacteria and side effects such as allergic or toxic reaction in human body [1]. Therefore, many countries set up maximum residue levels (MRLs) to protect human health. Thus, it is necessary to develop a sensitive and selective analytical technique for detecting TCs.

Here, enzyme linked aptamer assay for detection of TC based on the hybridization of oligonucleotide (probe) to aptamer was studied. Aptamers are synthetic single-strand DNA or RNA oligonucleotides that bind to a specific target molecule, and they have more advantages than antibodies as a typical binder [2]. In this study, a 76mer-I DNA TC aptamer was utilized as a capture binder and three complementary oligonucleotides (18mer, 33mer-I, 33mer-II) and other TC aptamers (76mer-II, 57mer) were used as a detector. Various assay conditions were optimized and dose-response curves are obtained. Especially, with 18mer probe and 33mer-I probe we observed a good sensitivity. (LOD : 5.62 x 10^{-14} M and 8.13 x 10^{-16} M, respectively) From these results, a newly proposed oligonucleotide-based enzyme linked aptamer assay is expected to become a novel approaches for the determination of small molecule such as TCs.

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PT-061 [식품/농학]

Pattern analysis of bio-converted mulberry leaves by HPLC-DAD

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Bio-conversion technology is interested recently to improve the pharmacological activities. In these days, our research group improved the anti-diabetic and anti-obesity activities by bioconversion of the leaves of *Morus alba* L. (Moraceae) based on enzyme treatment [1]. However, it is unclear how to change the chemical composition of the leaves of *M. alba* by bioconversion. Therefore, this study aimed to verify chemical profile between mulberry leaves extract and the enzyme processed products to explain the enhanced bioactivity and to investigate marker compounds for quality control of bio-converted *M. alba* extract by HPLC-DAD. Firstly, liquid-liquid extraction was applied to remove sugar and protein [2]. The HPLC-DAD was performed using Hector - M C_{18} column (4.6 × 250 mm, 5 ㎛). Mobile phase was 0.1% formic acid in water (A) and 0.1% formic acid in acetonitrile (B) under gradient conditions; 0 min at 5% B, 80 min at 20% B, 115 min at 61% B, 121 min at 100% B at a flow rate of 1.0 mL/min. In the result of pattern comparison, new peak was not observed by bioconversion. However, six peaks were increased by bioconversion of *M. alba* leaves. Consequently, it supposed that the active compounds contents of *M. alba* leaves were increased by bioconversion using enzyme and the increased peak will be good marker compound candidates. The six peak will be identified by LC-MS in further study.

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PT-062 [식품/농학]

Raman spectroscopic study of rice aging

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Rice (Oryza sativa L.) is one of the most consumed and the leading food crops in the world.[1] Harvested rice is subjected to varying periods of storage depending on demand. During storage of rice, rice aging inevitably occurs and is sophisticated process involving changes in structure, physicochemical properties.[2] The effects of aging process on rice are complicated, and the mechanisms of rice aging are still not fully understood.[3-4] Raman spectroscopy can be used to obtain information on molecular of rice samples in a non-destructive manner. Changes depending on rice aging were characterized by Raman spectroscopy. The aim of this study was to investigate structural changes in rice during rice aging, which will facilitate an enhanced understanding of the rice aging mechanism.

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PT-063 [식품/농학]

Liquid extraction surface analysis coupled with micellar electrokinetic chromatography of neutral pesticides on solid surface

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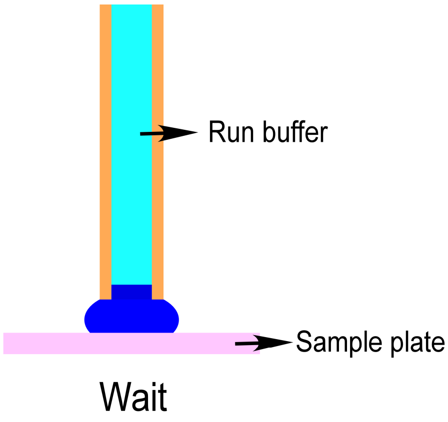
Capillary electrophoresis (CE) is well suited for the analysis of analytes in aqueous solutions. It is not easy to analyze a solid sample with CE since labor-intensive sample pretreatment processes are required. For example, a solid sample should be grounded, homogenized, centrifuged, extracted into an organic solvent, and then reconstituted into an aqueous solution suitable for CE. So we used liquid extraction surface analysis (LESA) that extract chemicals on the surface of various solid samples without any sample pretreatment.

Dried analytes doped on a surface were directly extracted to a hanging drop of acceptor at the inlet tip of a capillary. After extraction, a small volume of acceptor was injected into the capillary and analyzed by a commercial CE instrument. LESA-CE was used to determine three species of insecticides, chlorantraniliprole, kresoxim-methyl, and pyraclostrobin. The U.S. Environmental Protection Agency (EPA) limits the allowable amounts of the insecticides to 1.2 ppm, 0.5 ppm, and 1.5 ppm respectively. For these water-insoluble neutral analytes, micellar capillary electrophoresis (MEKC) was used and an on-line stacking method, analyte focusing by micelle collapse (AFMC) was combined to enhance the sensitivity. These three pesticides doped on sample plate were extracted with the inlet of a capillary and analyze directly with CE. Several parameters such as the condition of AFMC-MEKC, composition of an acceptor, extraction time were optimized. The limits of detection (LODs) of LESA-AFMC-MEKC were at least 150 times lower than EPA guideline value. Thus LESA-CE is a simple, sensitive and more rapid method for the analytes solid surface analytes without any pretreatment processes required for conventional analysis methods. The developed LESA-CE of high spatial resolution and immediate quantification ability is promising for the analysis of biological surfaces of cells and tissue, or even technical surfaces.



PT-064 [식품/농학]

Size-based fractionation of starch granules using split flow thin cell (SPLITT) and size-characterization by gravitational field-flow fractionation (GrFFF)

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Starch is obtained from cereals (corn, potato and rice), and is used in food, paper, mining industries, and in the production of adhesives [1]. Starch granules from various botanical sources vary widely in the granular size and shape as well as in the composition of amylose, amylopectin and protein, thus leading to differences in functional properties and industrial applicability [2]. In addition, size of starch granules has an important influence on the enzymatic reaction of the starch.

The sieving may be used for size-based fractionation of the starch granules. However the sieving may cause damages to the starch granules by mechanical forces. The split flow thin cell (SPLITT) is a preparative scale-separation technique that provides fractionation of polydispersed samples into two subpopulations of different sizes. SPLITT uses an open channel, and thus mechanical damages are minimized. It can also be used in a large scale as the sample can be fed continuously [3].

In this study, SPLITT was employed for a size-based fractionation of two types of starch granules (corn and potato) in a large scale. The SPLITT fractionation results were checked by optical microscope (OM) and gravitational field-flow fractionation (GrFFF). Then differential scanning calorimetry (DSC) was employed to understand the structural changes underlying gelatinization. DSC measures changes in thermal properties and microstructure of a sample as a function of temperature along with time [4]. Results from DSC suggested that the composition of the starch granules may vary with their sizes and types.

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PT-065 [식품/농학]

Studies of analysis on halophytes for the west-south coast in korea

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We have developed a reduced material that reduces the amount of salt consumed using lactic acid fermented native plants, and we want to study seasoned foods with low sodium content using them. The salinity of these raw materials was measured by Mohr method and amino acid, chlorine and chlorophyll were measured. DPPH assay, FRAP assay, and NO production were measured to examine the functional activity of the native plant extracts. The salinity and solids contents of Salicornia herbacea L. and Spergularia marina L. Griseb were 3.82% and 1.01 %, respectively. Total amount of amino acids was found to be 183.58 mg/100mg in Salicornia herbacea L., and 3232.4 mg/100mg in Spergularia marina L. Griseb was found more than 15 times of Salicornia herbacea L.. The results of chlorophyll-a measurement related to the sensory quality of green tea were similar to those of 20 mg/L.

PT-066 [식품/농학]

Accurate screening of 154 multi-class illegal adulterants in dietary supplements based on high-resolution extracted common ion chromatogram and neutral loss scan by UHPLC-Q/TOF-MS

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Illegally adulterated supplements are being widely distributed via Internet and local markets because food adulterants are not regulated as strictly as synthetic drugs are. In this study, rapid screening method was developed for detection and confirmation of 154 multi-class illegal adulterants (31 NSAIDS, 40 diuretics, 34 weight loss drugs, 35 psychotropic substances, and 14 cannabinoids) in supplements by UHPLC-Q/TOF-MS. Cleanup of sulfonamides from dietary supplements was performed by simple pH control liquid-liquid extraction taking consideration into chemical properties. The 98 basic adulterants were successfully separated on 1.7 μm fused-core C18 particles in a 100 x 2.1 mm column with mobile phase (A : 0.1% formic acid in water; B : 0.1% formic acid in acetonitrile) and sensitively detected in positive ion mode. The 56 acidic adulterants were separated using fused-core C18 particles column (150 x 2.1 mm, 1.7 μm) with mobile phase (A : 10 mM ammonium formate in water; B : acetonitrile). A broad range of 154 adulterants were successfully separated within 10 min and sensitively detected at sub-ppb levels with dual ionization modes. Their MS/MS spectra were preferentially investigated to find common ions and specific fragments. As results, specific common ions were observed to reflect their structural characteristics: *m/z* 78 and 80 for sulfonamides, *m/z* 155 and 144 for synthetic cannabinoids, and *m/z* 125 and 158 for sibutramine analogues. Also specific neutral loss were observed to reflect their structural characteristics: H_2O and CO_2 for acidic adulterants and HCl for Cl-thiaizide analogues. Extracted common ion chromatograms (ECICs) and neutral loss scan (NLS) could effectively apply for rapid screening of illegal adulterants in supplements. Also, these characteristic high resolution (HR) fragmentations based on reduced mass tolerance window could be used as diagnostic ion of elucidation of new emerging multi-class adulterants and avoided false positive and/or negative results in supplements. The established method can be employed to screen, confirm, and determine illegal adulterants such as NSAIDs, diuretics, weight loss drugs, psychoactive substances, and synthetic cannabinoids in various types of dietary supplements to ensure people's safety.

PT-067 [환경]

Current status of antibiotics residues in ground flatfish farms of Jeju province

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Flatfish(*Paralichthys olivaceus*) is the most widely aqua-culturing fish species in Korea (about 50%). Especially, Jeju special self-governing province accounts for more than 60 percent of its total production [1]. Ground fish farm is common aqua-culturing facility for flatfish, but highly-densed aquaculture of flatfish causes a variety of fish disease. Accordingly, antibiotics are over-administered in the aquaculture aquarium. Moreover, the effluents from these ground fish farms are discharged directly without additional water treatment processes excluding physical aeration. Therefore, onsite monitoring of the residual amounts of antibiotics in the ground fish farms is needed.

In this study, water samples were collected from aerated influent, two types of rearing water samples depending on fish size of rearing tanks (*i.e.*, juvenile < 200 g ; adult > 700 g) and effluent after mixing of two rearing waters in four ground flatfish farms in the coastal areas of Jeju province. Filtered and pH adjusted water samples are extracted using Waters HLB combined MCX cartridge with methanol. Main target antibiotics are Tetracyclines(TCs) comprising oxytetracycline(OTC), tetracycline(TC), chlortetracycline(CTC), doxycycline (DC), which are commonly used antibiotics for flatfish diseases (*ex.* Scutica disease, streptococcus disease) in Korea [1].

Among the TCs analyzed, OTC was detected in all seawater samples, however CTC, TC, DC were not detected (expressed as ND below). The levels of OTC were 5.3～8.3 ng/L in influents, 17.6～27.2 ng/L in rearing waters for juvenile fish, 29.5～52.1 ng/L in rearing waters for adult fish, and 15.6～28.6 ng/L in effluents. Especially, the concentration levels of OTC in effluents was higher than those of our previous studies [ND～6.2 (average 2.7 ng/L)], which were performed for seawaters in marine fish and shellfish farms and coastal waters in South Sea [2]. These results indicate that the effluent discharge from ground flatfish farm might affect the coastal ecosystem of Jeju province more adversely compared to other coastal areas of Korea.

Therefore, the periodic monitoring for various and more ground fish farms and horizontal and vertical antibiotics investigations for the coastal waters of Jeju province are needed to be performed. In addition, antibiotics treatment processes such as advanced oxidation processes (*ex.* reverse osmosis and ozone oxidation) are need to be considered based on economic efficiency because simple physical aeration for effluent might not to remove the antibiotics efficiently. It is time to know that the sustainable aquaculture is important seafood resource to human in the future.

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PT-068 [환경]

Concentrations and compositions of polycyclic aromatic hydrocarbons in sediments and organisms from the densed coastal aquaculture farms in South Korea

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Polycyclic aromatic hydrocarbons (PAHs) have two or more aromatic rings and theoretically there are about 200 substances. Among these, 16 PAHs were listed as priority pollutants in Korea. The sources of PAHs in the coastal fisheries environment are dry and/or wet deposition of atmospheric PAHs caused by incomplete combustion and oil spill accidents in coastal areas [1]. Several studies have been reported regarding the concentrations of PAHs in coastal marine environments. But there have been few researches to compare the concentrations and distribution patterns of PAHs in sediments and aquaculture organisms together. In this study, the sediments (54 sites) and aquaculture organisms (29 sites, 31 individuals) from the densed coastal aquaculture farms in East, West and South coasts were collected. The samples were accelerated solvent extracted (for sediment) and liquid-liquid extracted (for organism) and cleaned-up with silica-gel column. The concentrations of the 16 PAHs were measured by using a gas chromatograph coupled to a mass spectrometer based on selected ion monitoring.

The total concentrations of $\sum_{16}$PAHs in sediments ranged from 15.1 to 1,150 ng/g dry weight (dw). The average concentration of $\sum_{16}$PAHs was the lowest in West coast (mean: 58.3 ng/g dw), followed by South-West coast (mean: 63.3 ng/g dw), East coast (mean: 196 ng/g dw), and the highest in South-East coast (mean: 287 ng/g dw). There are probably high population density and the emission sources such as incinerator, sewage treatment plant, and industrial complex. The total concentrations of $\sum_{16}$PAHs in collected organisms ranged from 2.39 ~ 106 ng/g dw (mean: 35.3 ng/g dw). The West and East coasts showed relatively higher residual levels of $\sum_{16}$PAHs than the South-West and South-East coasts. Relatively high concentrations of $\sum_{16}$PAHs were observed in bivalves and sea squirt (*Halocynthia roretzi*) than in seaweed, which might be due to the filter feeding character of bivalves and sea squirt. The high molecular weight PAHs (4~6 rings) accounted for 83% and 85% of total PAHs compositions in sediment and organism, respectively.

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PT-069 [환경]

PBDEs and methoxylated-BDEs in antarctic toothfish (*Dissostichus mawsoni*): with comparison to the coastal seafood from Korea

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The presence of persistent organic pollutants (POPs) has been identified in Polar Regions, where have low human population due to their physicochemical properties [1]. There have been various POPs studies such as DL-PCBs investigation in Polar Regions but little information regarding polybrominated diphenyl ethers (PBDEs) and one of their metabolites, methoxylated BDEs (MeO-BDEs) [2]. The Antarctic toothfish (*Dissostichus mawsoni*) is a key component of the Ross Sea ecosystem of Antarctica, feeding on a wide range of prey but bring primarily fish-eating piscivorous. Therefore, we investigated the concentration levels of PBDEs and MeO-BDEs in Antarctic toothfish and compared the result with those in domestic coastal seafood.

The concentrations of PBDEs and MeO-BDEs in liver tissue of female toothfish were higher than those of male toothfish ($p < 0.05$). While there were little differences of PBDEs and MeO-BDEs concentrations according to tissue parts (*i.e.*, liver and muscle). Moreover, PBDEs and MeO-BDEs concentrations in muscle and liver tissues were not correlated with the weight of toothfish. Deca-BDE and tetra-BDE were the predominant homologue of PBDEs and MeO-BDEs groups in both toothfish and domestic seafood, respectively. Meanwhile, MeO-BDEs appeared to be higher than PBDEs in toothfish and domestic seafood and in all tissue parts, which might indicate to be affected from not only natural formation of MeO-BDEs in marine ecosystems but also the transformation of PBDEs to MeO-BDEs and inter-conversion among the metabolites inside organism tissues. In addition, the concentration of MeO-BDEs in toothfish is higher than those in domestic seafood.

So we need to investigate more environmental compartment such as seawater, marine biota, and etc. in Antarctic area to resolve what the present levels of MeO-BDEs in toothfish showing higher concentration than domestic coastal seafood is via biomagnification from naturally originated or metabolic activity in toothfish itself because Antarctic toothfish will be the substitute seafood to Patagonia toothfish (*Dissostichus eleginoides*).

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PT-070 [환경]

Levels and distribution of PCDD/Fs and DL-PCBs sediment and organisms from the coastal aquaculture farms of Korea

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Persistent organic pollutants (POPs) including polychlorinated dibenzo-*p*-dioxins and furans (PCDD/Fs) and dioxin-like polychlorinated biphenyls (DL-PCBs) have been regulated by the Stockholm Convention to protect human health and the environment[1]. In Korea, the routine monitoring network of POPs in marine environments have been conducted, which investigated the POPs levels in sediments and organisms from locations near urban area, big harbor, and industrial complex[2]. However, POPs in sediment and aquaculture organisms in various aquaculture farms along the Korean coasts have not been points of interests even though highly dense aquaculture activities have been conducted from inshore areas. Therefore, the objective of this study was to investigate the concentrations and distribution patterns of PCDD/Fs and DL-PCBs in sediment and aquaculture organisms from various aquaculture farms in the Korean coasts. The sediment (54 sites) and aquaculture organisms (31 sites) samples from aquaculture farms along coastal areas were collected in 2016.

The concentrations of organic contaminants in sediments ranged from 0.00 to 9.55 pg TEQ/g dw for PCDD/Fs and from 0.00 to 2.38 pg TEQ/g dw for DL-PCBs, respectively. The concentrations of PCDD/Fs were below the probable effect level (21.5 pg WHO_{1998}-TEQ/g dw) of the Canadian Sediment Quality Guidelines[3]. Masan showed relatively higher concentrations of PCDD/Fs and DL-PCBs than other locations. These locations are large commercial harbor and located near big cities and effluent discharging point of wastewater treatment plant. Therefore, the main sources of POPs in sediments and aquaculture organisms might be industrial activities and intensive shipping traffic, which could also raise the amounts of suspended particulate matters containing POPs in coastal waters. The concentrations of organic contaminants in aquaculture organisms ranged from 0.00 to 0.225 pg TEQ/g ww for PCDD/Fs, from 0.00 to 0.257 pg TEQ/g ww for DL-PCBs, respectively. The concentrations of dioxins (PCDD/Fs+DL-PCBs) in aquaculture organisms were below the restricted level (6.5 pg WHO_{2005}-TEQ/g ww) of the European Union[4].

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PT-071 [환경]

Levels and compositions of perfluorinated chemicals in muscle tissues of antarctic toothfish (*Dissostichus mawsoni*)

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Although the human presence in Antarctica is low, contamination of persistent organic pollutants was documented in the region since 1960s. Due to their physicochemical properties and low decomposition rate, POPs such as perfluorinated chemicals (PFCs) are transported over long distances and/or widely dispersed into the environment after released [1]. PFCs are man-made chemicals which have carbon-fluorine bonds and one more reactive functional group such as an alcohol, a carboxylic acid, a sulfonic acid, a phosphoric acid. In the year 2000, the American company 3M that was the main producer of the substance, voluntarily ceased the production and sale of Perfluor-1-ooctanesulfonate (PFOS) and related compounds because PFOS surprisingly was found in high concentrations widespread in the environment, included in remote areas such as Arctic and Antarctic [2]. Some PFCs can elicit harmful effects in terrestrial and aquatic organisms [2,3]. PFOS also biomagnifies in wildlife at higher tropic levels in the food chain. To human, the main exposure routes of PFCs are foodstuff and water. In foodstuff, levels of PFCs in fish and shellfish were reported to be higher than other foods [3]. In this study, we measured concentrations of 15 perfluorinated compounds (PFCs) in muscle tissues of Antarctic toothfish (*Dissostichus mawsoni*), and investigated accumulation patterns of PFCs in female and male muscles. The Antarctic toothfish is a key component of the Ross Sea ecosystem of Antarctica, feeding on a wide range of prey but being primarily fish-eating piscivorous. Therefore, preliminary investigation of PFCs concentration in muscle tissues of Antarctic toothfish was performed to provide the valuable monitoring data of PFCs to assess the possible mid-biomagnification of PFCs in Antarctic food-web. Antarctic toothfishes were collected in 400-600 m depth in Subarea 88.1 and SSRU 88.2E of the southern Ross Sea and selected according to gender and sexual maturity (4 stages), which were 50 of male samples [sexual stage 1(1 sample), 2(35); 3(14)] and 63 of female samples [sexual stage 1(6), 2(23), 3(33), 4(1)]. 15 PFC compounds including PFOS were analyzed and total PFCs (Σ15PFCs) were ND (not detected) to 2.98 ng/g wet weight (ww) in muscle tissues with 0.32 ng/g ww of median concentration. The main compounds among PFCs were PFHxA and PFPeA. There was significant difference of PFCs concentrations according to gender ($p < 0.01$) and Gender-specific PFCs compositions were observed. However, PFCs concentrations in muscle tissue were not correlated with weight of toothfish, which means that sexual maturity might not play an important role for PFCs residues in male and female muscle tissue. The levels of PFCs in the present study are comparable to those reported in 31 fish species from Korean coastal waters (0.27-4.81 ng/g ww) [4]. The concentrations of PFOS (ND~0.05 ng/g ww) in the present study were much lower than the environmental quality standard for biota (9.1 ng/g ww) by EU Water Framework Directive [3]. However, composition of PFCs in the present study is different from those in 31 fish species from Korean coastal waters, which mainly contained PFOS, PFUnDA, and PFTrDA [4].

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[3] J.J. Heo, J.W. Lee, S.K. Kim, J.E. Oh, *J. Hazard Mater.* 279 (2014) 402.
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PT-072 [환경]

Hygroscopic properties of size-segregated aerosol particles in Seoul and Daejeon, Korea during early-summer and winter, respectively

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The hygroscopic properties of size-segregated atmospheric aerosol particles were investigated at two urban sites in Seoul and Daejeon, Korea during early-summer 2016 and winter 2012, respectively. The size-segregated aerosol samples were collected using an 8-stage cascade impactor. Hygroscopic growth factors, g(RH) of water-soluble matter (WSM) were analyzed by a hygroscopic tandem differential mobility analyzer (H-TDMA). The g(RH) at 90% RH, g(90%), ranged from 1.51 to 1.61 with a mean of 1.56 in Seoul whereas it ranged from 1.56 to 1.60 with a mean of 1.58 in Daejeon. The mean g(90%) of fine particles (< 1.1 μm) were 1.54 and 1.59 in Seoul and Daejeon, respectively whereas those of coarse particles (> 1.1 μm) were 1.57 and 1.58 in Seoul and Daejeon, respectively. The result implies that the Daejeon samples in the fine size mode were more hygroscopic than the Seoul samples. Average hygroscopicity parameter of WSM, κ, was determined to be 0.36 and 0.38 in Seoul and Daejeon, respectively. These values were slightly higher than that (0.30) of water-soluble organic carbon (WSOC) whereas lower than those of NH_4NO_3 (0.68) and $(NH_4)_2SO_4$ (0.52). To investigate the effect of biomass burning on the hygroscopicity of aerosol particles, linear regression analyses were performed using g(90%) and the mass fraction of OC to the sum of total water-soluble inorganic ion and OC. The g(90%) of WSM in the size range of 0.4 μm - 0.7 μm decreased with increasing the OC mass fractions in both Seoul and Daejeon. The g(90%) of WSM in Seoul correlated moderately with the OC mass fraction. On the other hand, the g(90%) of WSM in Daejeon correlated highly with the OC mass fractions. Thus, these results imply that the hygroscopic growth is closely related to OC.

PT-073 [환경]

Chemical characteristics of size-segregated atmospheric aerosols in Seoul and Daejeon, Korea during early summer and winter, respectively

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To investigate the chemical characteristics of the size-segregated atmospheric aerosols, aerosol samples were collected using an 8-stage cascade impactor sampler in Seoul and Daejeon during early summer 2016 and winter 2012, respectively. Size-segregated aerosol samples were analyzed for water-soluble inorganic ions, organic carbon (OC)/elemental carbon (EC), levoglucosan, and mannosan. Size distributions of Na^+, Cl^-, Mg^{2+}, and Ca^{2+} showed the peak values in the coarse size mode (2.5 μm − 10 μm) in both Seoul and Daejeon whereas K^+ and secondary aerosols including NH_4^+, SO_4^{2-}, NO_3^- showed the peak values in the fine size mode (< 2.5 μm). Levoglucosan and mannosan showed unimodal size distributions peaked at 0.7 μm − 1.1 μm and 0.4 μm − 0.7 μm in Seoul and Daejeon, respectively during biomass burning episodes. Meanwhile, during the haze episode, concentrations of secondary aerosols (NH_4^+, SO_4^{2-}, NO_3^-), K^+ and OC increased significantly in the fine size mode. It was also found that a large amount of Cl^- was depleted in Seoul via the reaction with acidic gases. Levoglucosan correlated well with mannosan in both Seoul and Daejeon whereas poor correlation was observed between levoglucosan and K^+. OC correlated well with both levoglucosan and K^+ in Daejeon whereas poor correlations were observed between OC and biomass burning tracers in Seoul. This result implies that OC in the Daejeon samples was associated with biomass burning whereas that in Seoul was associated with other emission sources rather than biomass burning. Average mass ratios of levogluosan to mannosan during the biomass burning episodes were 3.81 in Seoul, which was similar to the burnings of softwoods and leaves. On the other hand, those during the biomass burning episode in Daejeon were measured to be 22.02, which was similar to the burnings of hardwoods and Asian crop residues. These results indicate that the characteristic of biomass burning in Korea is site-specific.

PT-074 [환경]

A study on the quantitative analysis of chloride in various fuel materials

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Recently, environmental pollution is one of the significant matter around the world such as increase of waste problems, greenhouse effects due to fossil fuel. Therefore, a research of alternative fuel materials is in progress to solve environmental problems. [1] Studies on solid fuels of combustible wastes have been conducted since the early 1990s because wastes are highly valued as alternative energy source. New recyclable energy material, SRF and Bio-SRF are highly valued but they contains harmful component such as chloride which leads to negative impacts on power plant systems. [2] Therefore, there is a restriction on chloride content. In this study, we investigated content of chloride in various fuel materials (Coal, woods, SRF, Bio-SRF etc.) using quantitative analysis via ion-chromatography. .

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PT-075 ［환경］

Study on characters of asbestos on the suface of asbestos building materials and performance evaluation of asbestos scattering inhibitor

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In this study, a test for asbestos scattering limit on asbestos head lining and scattering tests before and after applying a scattering inhibitor on a subject target were implemented. The result of the asbestos scattering limit test confirmed the possibility of asbestos scattering on both the front and back side of the interior material. Tests regarding the efficiency of the scattering inhibitor showed that in the absence of the scattering inhibitor, the detected asbestos concentration exceeded the limit prescribed as per the indoor air quality guidelines; however, with the application of two types of scattering inhibitors, the asbestos concentration in the indoor air was less than the prescribed limit. These results confirmed that the asbestos scattering inhibitor is effective in suppressing the spattering of asbestos; however, it will be necessary to have regulatory controls such as the obligatory use of scattering inhibitor after development of which can prevent all asbestos scattering inhibitor.

The results of this study are expected to be utilized as base data for both the maintenance and development of various management programs aimed at an effective maintenance of asbestos building material.

PT-076 ［환경］

Development and application of reference material for otolith micro-analysis using LA-ICP-MS

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Otolith (otolith, ear stone) is a bone fragment of a fish's inner ear, mainly distributed in the crystalline phase of aragonite or vaterite, and grows like a tree ring. Calcium is the main composition of otolith, grows with substituted by Sr, Mg and Ba. These components show different distribution patterns for sea water and fresh water, so it is possible to study the habitat environment by analyzing the content of these elements. In particular, since recurrent fishes (eel, salmon, etc.) relax and grow in the freshwater and seawater areas, studies on their habitats are very important to study the characteristics of a fish migration cycle, habitat characteristics and information on environmental science [1].

However, otoliths that record information on the habitat environment have very slow growth and size of about several mm. In order to study characteristics of the growth period, LA-ICP-MS (Laser ablation Inductively Coupled Plasma Mass Spectrometry) are required. However, this analytical method has limitations on the range of its application compared to the possibility of application, and the key to enhancing the reliability of the result of the analysis is to use a reference material of the same matrix as the reference material is secured. The otolith study method by existing LA-ICP-MS is based on the NIST standard substance (NIST 610/612/614, etc.) as the external standard substance, but the accurate quantitative analysis is limited due to the mismatch between the otolith and the NIST standard substance. Therefore otolith studies using LA-ICP-MS generally rely on the abundance ratio of elements using the detected intensity ratio of elements.

The spot analysis, which is a conventional method, takes a long time and does not record all the change information of the element distribution according to the interval between the points. [2] Recently, Line analysis is used to analyze the ratio of elements in the ostium without loss of element distribution information in a short time.

In this study, we investigated the suitability and homogeneity of calcium carbonate minerals as a reference material for analyzing elemental compositions in otolith by using commercially available crystalline calcium carbonate minerals. We also attempted to analyze the constituent elements of the otter stone and compare them with existing results.

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PT-077 [환경]

Optimization of analysis method on recycled Vanadium(V) oxide from urban mine

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It was studied by the vanadium oxide of the recycling metal oxide for the revival of the government's stock of reclaimed metal through urban mine. Determine the management element and management standard, and then optimize the test methods applicable to each element for the field.

Currently, there is no standard test method for the evaluating purity and impurities of the vanadium oxide which was recycled to metal oxide foam from waste catalyst.

This study provided a standardized test method optimized for the criteria of the elements managed by the government and the field.

In order to analyze the vanadium oxide, various analytical methods were reviewed the standard methods of KS, ASTM and JIS and also applied for the elements of analysis with ICP-OES, AAS, Infrared absorbing method, Gravimetric determination and Spectrophotometry.

Using the test specifications for certified reference materials, the standardization of analysis methods were suggested that the analysis results derived and compared to the wet and dry analysis methods. And then the validity of testing methods were verified with the simultaneous analysis of other agencies

PT-078 [환경]

Analysis and comparison of the volatile organic compounds between the cigarette smoke condensate (CSC) and extract (CSE) samples

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Cigarette smoke is a major risk factor for several diseases including chronic obstructive pulmonary and cardiovascular diseases [1]. The toxicity by the cigarette smoke can be determined *in vitro* cytotoxicity [2]. The cytotoxicity test of the cigarette smoke is commonly conducted using the smoke cigarette condensate (CSC) and smoke cigarette extract (CSE). The CSC and CSE methods are well known for sampling of the particles and water-soluble compounds in the cigarette smoke, respectively [3, 4]. In this study, the CSC and CSE were analyzed by gas chromatography-mass spectrometry (GC-MS) system equipped with a wax column (for separation of the volatile organic compounds). The cytotoxicity effect of the CSC and CSE should be evaluated thoroughly by comparing the analytical results of the CSC and CSE samples. The total concentration of the volatile organic compounds (VOCs) detected in the CSC sample was three times higher than that of the CSE sample (based on the peak area). Except for dimethyl sulfoxide solvent, nicotine had the highest concentration in the CSC sample, while acetonitrile recorded the highest concentration in the CSE sample (relative proportion = (1) CSC sample: 52.8% (nicotine), 17.0% (nicotyrine) 3.03% (glycerol triacetate), 1.21% (2-fluorophenol), 1.15% (phenol), etc.) and (2) CSE sample: 17.9% (acetonitrile), 17.2% (acetone), 11.9% (acetone cyanohydrin), 8.60% (nicotine), 5.61% (nicotyrine), etc.). As such, to accurately examine the cytotoxicity of the cigarette smoke using CSC or CSE, the components and their concentrations in the CSC and CSE samples should be considered preferentially.

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PT-079 ［환경］

Concentration variation of volatile organic compounds by light exposure when gaseous sample collection using PVF tedlar bag

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The National Institute of Chemical Safety manages 97 kinds of chemical substances, which can cause a big scale of damage in the chemical accident. When a chemical accident occurs, a team should be dispatched to the site to collect air samples. The gaseous compounds released from the site are collected by canister method, adsorption method, and Tedlar bag method. Tedlar bag method has some advantages such as simple collection, direct analysis without any pretreatment. However, it may occur concentration decrease or increase because volatile organic compounds produce photochemical oxide by photochemical reaction with light. Therefore, Korean standard methods recommend that tedlar bag samples should be shielded from light and analyzed within 24 hours after sampling. These two factors are very important to preserve sample from sampling to analysis.

In this study, two experiments were conducted to confirm sample preservation without any concentration change of VOCs. The first experiment factor is light. The light-shielded sample and the light-exposed sample were prepared, exposure lights were 2 types of sunlight and incandescent lamp. As a result, the light-exposed sample concentrations were increased or decreased by 0.2~60% compared with the light-shielded samples. Hydrocarbon group (Propylene, 1,3-Butadiene) was not significantly changed. For Freon gas group, Freon 11,12 increased or decreased from 0.2 to 16% and also Freon 113,114 concentrations increased or decreased from 0.2 to 4%. The second experiment factor is exposure time. The light-exposed samples were exposed by incandescent lamp for 0, 2, 6, 12, 24, 36, 48 hours respectively. As a result, the light-shielded sample concentration was decreased more than 90% after 36 hours. The light-exposed samples were decreased significantly after 24 hours.

Variation of VOCs concentrations were within 10% when sample introduce into analytical instrument within 6 hours after sample collection. After 24 hours, the concentrations of samples were decreased rapidly. It can cause errors in quantitative analysis. If the light is not blocked from the sampling to the analysis, the concentration variation was 0.2 ~ 18%.

PT-080 [환경]

Biomonitoring of environmental phenolic compounds in the South Korean adult’s urine.

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Environmental phenolic compounds (EPCs) and its derivatives are widely used in cosmetics, personal care products, and food packaging ink. The use of EPCs has been raised concerns about the potential health risks associated with its endocrine-disrupting effects. Urine samples (n=1,955) from the South Korean adults aged 18-83 years were collected to evaluate EPCs concentrations. Urinary concentrations of EPCs were analyzed using liquid chromatography tandem mass spectrometry. The detection rate for 5 parabens (MtPb, EtPb, PpPb, BtPb/IsoBtPb) were 89, 94, 88 and 62%, 3 benzophenones (BP-1, BP-3, BP-4) were 51, 56 and 52%, BPA, t-BP, TCS were 41, 64 and 39%, respectively, whereas those for BPF, BPS, n-BP, n-PP, n-HxP, n-HtP, t-OP, n-OP, NP, BP-2, BP-8, 4OH-BP, 2,4-DCP, 2,5-DCP, 2,4,5-TCP, 2,4,6-TCP were all below 30% [limit of quantitation (LOQ) 1 ng/mL]. The geometric means of urinary EPCs concentration range were 1.03-1.41 ng/mL (3 bisphenols), 2.53-46.54 ng/mL (5 parabens), 0.96-3.36 ng/mL (8 alkylphenols), 0.47-3.92 ng/mL 6 benzophenones), 1.28-2.54 ng/mL (5 chlorophenols). The correlation was observed between urinary concentrations of EPCs and its derivatives, which is an important indication of exposure biomarkers. This study might be contributed to establish health risk assessment and safety.

PT-081 [환경]

Strategies for improvement of air quality in subway stations

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In addition to the social interest in dust, the study on the improvement of the air quality of the underground history was carried out by the present situation. Usually, this dust is usually originated from tunnels, passengers, or outdoor air. As for now, the dust from tunnels and passengers is not easy to control. Strengthening the dust(PM10) management standards and establishing the dust(PM2.5) management standards. In addition, an efficient management system will be established through analysis of recent technology trends and effects for indoor air pollution reduction.

In this study, the effect of outdoor air on the subway air quality was investigated, and various factors was found to be effective. Based on these results, some strategies for the improvement of air quality in subway stations were suggested in this study.

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PT-082 [환경]

Evaluation of recovery yields and uncertainties for bulk analysis of uranium and plutonium isotopes at ultra-trace levels by using MC-ICP-MS

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Multi-collector induced coupled plasma mass spectrometry (MC-ICP-MS) is widely used for isotopic and quantitative analyses of nuclear materials at ultra-trace levels in environmental swipe samples, which is a very useful for monitoring undeclared nuclear activities. In our laboratory, effective chemical pre-treatment procedures and chemical separation techniques based on UTEVA resin were developed to effectively separate uranium and plutonium. For isotopic ratio measurements and quantifications of uranium and plutonium isotopes, we adopted MC-ICP-MS(Neptune plus, Thermo Scientific. Germany) and IDMS(Isotope Dilution Mass Spectrometry). In this study, the bulk analysis of uranium and plutonium in simulated swipe samples prepared by adding uranium standard (U030, ~10 ng) and plutonium standard (IRMM 290A1, ~2pg) was performed to validate the analytical procedures. The recoveries of uranium and plutonium were more than 95%, and the results of isotopic ratio measurement were in good agreement with the certified values. We also estimated the combined uncertainties during the overall chemical procedures based on analytical results obtained from regularly performed bulk analysis of uranium and plutonium in simulated swipe samples. The detailed results will be presented in poster.

PT-083 [환경]

Comparison of various acid digestion methods for the determination of metals in several coal combustion residuals

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Electric power generation in Korea is heavily dependent on coal-fired electrical power system, which has accounted for 48.8% of total power generation in 2015. As a result, it brings more than eight million tons of coal combustion residuals (fly ash and bottom ash) annually. Not only to evaluate their environmental impacts but to increase waste recycling, many researchers have studied on coal combustion residuals, and especially, (heavy) metals in coal combustion residuals are important issues. However, acid digestion methods applied in each research are different with each other which can draw wrong results. In this study, we have compared with various acid digestion method for the determination of several trace metals (As, Sb, Pb, Cd, Cr, Zn, Ni) in three fly ashes and one bottom ash from three coal-fired electric power plants in Korea; HCl, HCl+$HClO_4$, HNO_3,HNO_3+$HClO_4$, AR(HCl+HNO_3), AR(HCl+HNO_3)+$HClO_4$, and HF+HNO_3+HClO.The concentrations of most trace metals are the highest in the digestion method with HF+HNO_3+HClO. It might result from the very strong oxidizing power of HF, especially effective for the destroy of SiO_2based matrix in coal combustion residuals.

PT-084 [환경]

Identification of pollutants in water using oxygen and nitrogen stable isotope ratio

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Water quality management using general techniques of chemical analysis has limitation in efficiently managing water pollutant through various pollutants sources. In order to identify of pollutant source, the methods of stable isotope ratio is widely employing around the world. The measurement technique of oxygen and nitrogen stable isotopes in water is employed to establish origin and pollution source of the water quality protection area in this study.

The target study sites, which are water resource, is located in G area, Korea. In order to compare seasonal characteristics, the water samples were collected 8 times from March 2016 to June 2017 on 5 locations. The oxygen and nitrogen stable isotope in the water samples were measured by IR-MS (KBSI supported).

As a results for the samples in 2016, it was considered that a most sites were originated from nature sources, but some sites showed the possibility of livestock wastewater and sewage sources inflow. Each nitrogen and oxygen stable isotope values were increased about 2~12‰ and 2~20‰ in rainy season, respectively, but after the end of the rainy season, the stable isotope values were decreased to a similar level as before the beginning of the rainy season. It could be considered that the inflow of pollutants dramatically increase by the heavy rain in the rainy season. The samples were collected 4 times in January, March, June, and August in 2017.

As a results of comparing the stable isotope values of March and June in 2016 and 2017, nitrogen stables isotope value of A site was increased about 3‰ in March 2017, C site and D site were decreased about 20‰ and 7‰ in June 2017. It was considered that the flow of streams stopped due to the drought in June 2017. The oxygen stable isotope value was decreased similar pattern with nitrogen stable isotope values. It is also because the flow of the streams stopped due to the drought and the inflow of the pollutants was blocked from outside.

PT-085 [환경]

Pesticides (Diazinon and Parathion) of proficiency testing in drinking water

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The proficiency testing is one of the quality control assurance procedures for testing result, in addition to testing performance evaluation. According to Guidance for laboratory accreditation system of authorized institutions of Korea Laboratory Accreditation Scheme (KOLAS), the accredited testing institutions must participate in proficiency testing at least once in every three years. As a KOLAS proficiency testing provider, the water quality research center of K-water Institute conducted a proficiency testing program on the analysis of pesticides, diazinon and parathion, in water for the accredited domestic and overseas testing institutions and prospective institutions according to KS Q ISO/IEC 17043 requirements during five weeks from 19 June until 21 July 2017.

The homogeneity and stability of samples were analyzed statistically by the method in ISO 13528 Annex B, while the standard deviation of proficiency measurements (σ_{pt}) was determined by TOMPSON method suitable for trace analysis. The set values were determined by the matching value of participants, which were 0.054 mg/L for diazinon and 0.106 mg/L for parathion. The z-score results showed that the number of institutions with satisfaction level of less than 2 for both items was 15, which was about 65% for diazinon and 71% for parathion.

PT-086 [환경]

Monitoring water quality conditions for drinking water treatment units in 17 cities of taiwan

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Taiwan is one of the most fast-growing water purifier market recently. Due to Taiwan's recent industrial development, water pollution has become a major concern. Industrial pollutants from factories have been a continuing source of contamination in its rivers. The problem demands attention because Taiwan's primary source of water are rivers.[1] It is necessary to monitor water quality when entering these markets of water treatment units. In this study, all the water samples are taken from tap water in 17 cities of Taiwan. Cities are Kaohsiung, Hsinchu, Taipei, Hualien, Taichung, Taoyuan and so on.

The water samples were analyzed for turbidity, color, TDS(Total Dissolved Solids), pH, free chlorine by electrometer and metallic elements(Al, Zn, Cu, Fe, As, Se, Pb, Cd, B, Ba, Sr, Cr3+, Ca, Mg, Na, K, Si) by ICP-AES(Inductively Coupled Plasma Atomic Emission Spectrophotometer) and anionic ion(nitrate, chloride, sulfate, fluoride) by IC(Ion Chromatography).

Comparing the result to domestic tap water quality in Korea, TDS are higher than tap water quality value in Korea. The significant pattern exist between regional differences. Following the result, optimized filtration system should be developed to meet the standard of water quality in each cities.

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PT-087 [환경]

A method siloxane analysis in clean room using thermal desorption gas chromatography mass spectrometer

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The processes applied to the LCD/OLED are operated in a clean room to control the pollution caused by the environment, UV exposure is also a process that requires environmental control, and it is very important to control the surface contamination of the lens that adjusts the exposure amount. The main source of the surface of the UV exposure lens is SiO_2, which is generated by the reaction of siloxane present in the clean room air with oxygen. In order to prevent contamination of the surface of the lens, the air and CDA supplied to the exposure system need to be managed at a very low siloxane level. The purpose of this study is to introduce the application of Thermal Desorption GC-MS(Gas Chromatography-Mass Spectrometer) technology for the quantitative analysis of siloxane in air, and the siloxane was collected by using a Tenax TA tube filled with porous polymer.

PT-088 ［환경］

Preparation and characterization of silver-complexed polymeric automobile cabin filter

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In consideration of recent environmental pollution problems, there is a growing interest in functional filters including automobile cabin filters. Air pollution by toxic gases and various bacterial viruses is caused by fine dust, oil and organic solvents, including dust from China. Unfortunately, existing automobile cabin filters are mainly to remove dust, and are not able to remove antibacterial or harmful gases.

In this study, silver-complexed polymeric fabric filter was added to existing automobile cabin filter, and its performance (such as the rate of metal impregnation, harmful gas removal rate, and antibacterial efficiency, etc.) was assessed against the contents of activated carbon. The content of activated carbon was varied at 52%, 62% and 65, respectively.

The surface treatment of the Ag-complexed fabric filter was analyzed and confirmed by IR and SEM. ICP-MS analysis showed that Ag content of the polymeric fabric was 2,500 ppm or higher. Gas chromatographic analysis showed the gas adsorption efficiency increases with the content of activated carbon, as expected. And all the bacteria were killed in a bacterial culture test

The technique developed in this study may provide some useful information to air purification industries including the automobile cabin filter production.

PT-089 [환경]

Development and Characterization of metal complexed air filter with carbon material

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Air pollution by fine dust, Volatile Organic Compound (VOC) and Foshan outflow, and bacterial viruses such as new influenza virus have become increasingly important issues. Among them, VOCs from automobile emission and consumption of oils and organic solvents are of particular concern because they contain carcinogenic substances. Gaseous contaminants and bacterial viruses may be removed partially by existing antimicrobial filters or polymeric filters. However, existing polymeric filters suffer from relatively low gas adsorption rate and antimicrobial efficiency.

In this study, we have developed a metal-complexed antibacterial polymeric filter with high antimicrobial properties. First, the surface of a polymeric fabric was chemically treated with –COOH functionality, and then a metal was complexed on the surface. The metal-complexed polymeric fiber was then sandwiched together with a carbon material.

The product was characterized using IR and scanning electron microscopy (SEM) to confirm surface treatment. The VOC gas adsorption efficiency was analyzed by Gas Chromatography (GC). The VOC adsorption time of the polymeric fiber before surface treatment was less than 5 min, while, after the surface treatment, the adsorption time was increased dramatically up to about 6 hours or more. A bacterial culture test showed that all bacteria were killed after 6 hours of culture.

It seems the air filter developed in this study has a potential for a wide range of applications in the field related with air purification.

PT-090 [환경]

Elemental concentrations of uncertified trace elements in SLRS-6

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To determine elemental concentrations in the sixth version of natural river water certified reference material, SLRS-6 (National Research Council – Conseil National de Recherches Canada), we used an ICP-SFMS (Element2, Thermo Scientific, Germany) equipped with the Jet Interface. Additionally, the normal H-skimmer cone was replaced by a X-cone. The ICP-SFMS was coupled to an APEX_Ω high-efficiency sample introduction system (APEX_Ω desolvation system, ESI, USA) and an auto-sampler (SC-4DX, ESI, USA) with enclosures. The instruments were installed in a Class 100 laminar airflow clean booth inside a class 1000 clean laboratory at KOPRI. The system was tuned daily to achieve the maximum instrumental sensitivity (typically ~2.5×10^6 counts per second for a 100 pg mL^{-1} indium solution) at low mass resolution. Here, we present uncertified trace elements data (Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Tl, Bi and Th) in SLRS-6.

PT-091 [환경]

A colorimetric probe to determine NO_2^- using label-free gold nanocrystals

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A simple and sensitive colorimetric method for the determination of NO_2^- ions in aqueous samples was developed using gold nanocrystals (AuNCs). The NO_2^- ion is selectively etched AuNCsand changing the particle shape. This etching resulted in a dramatic color change from vivid blue to light red. Using this methodology, the concentration of NO_2^- ions in environmental, biological and sitological samples could be quantitatively detected by the naked eye or by using UV-Vis spectrometry. Also, we found that the selectivity and sensitivity of the detection was noticeably improved at the 20mM of NaCl concentration, at which a more obvious color change was observed. The absorption ratios (A_{550}/A_{650}) of the modified AuNCs solution exhibited a linear correlation with NO_2^- ion concentrations within the linear range of 0.0~10 ppm, and the limits of detection in tap water and pond water were 0.154 μM and 0.162 μM, respectively. This cost-effective sensing system allows for the rapid and facile determination of NO_2^- ions in aqueous samples.

PT-092 [환경]

A development of passive sampling technique for gaseous mercury

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Mercury is global threat to human and environmental health. Atmospheric mercury can travel long distance and flow into aquatic environments. Mercury in aquatic environments can be transformed into methylmercury, which is far more toxic to human and animals and can enter and biomagnify in food webs. [1] As the Minamata mercury convention signed in October 2013, the establishment of a monitoring system for global and national dimension is needed. Recently Korea measure TGM concentration using Active sampling equipment (Tekran 2537) at 12 sites. But Active air sampling(AAS) system has spatial- and cost-limitation so it is unsuitable for investigation technique of national level. Passive air samplers(PAS) require no electrical energy and cost-effective way compared to Active sampler. Therefore, if we use passive sampler to investigate of atmospheric mercury concentration we will get high resolution spatial data.

This study target is atmospheric gaseous mercury and atmospheric gaseous mercury can divide to Gaseous elemental mercury(GEM) and Gaseous oxidized mercury(GOM). We carried out adsorbent performance test, diffusive housing assessment, wind tunnel test and cross analysis with active sampler. In case of GEM, adsorbent performance test was carried out using sulfur impregnated activate carbon and gold coated beads. We injected Hg^0 saturation gas into vial containing adsorbent using micro syringe and measured mercury concentration in adsorbent. In case of GOM, we used Cation exchange membrane(CEM) because it is difficult to injecting standard we refer to previous study. Diffusive housing test carried out using Radiello sampler. We deployed twelve set of PAS when study was started and removed randomly three set of PAS every week. We also measured meteorological factor (wind speed, humidity and temperature) and GEM concentration using Tekran 2537. Using those data, we estimated Sampling rate and uptake rate of PAS. Wind tunnel test carried out using 50cm diameter of acryl pipe and wind control fan. We estimated sampling rate and uptake rate variation according various wind speed.

Recovery of gold beads measured 107~114% but recovery of activated carbon could not measure because activated carbon blank concentration was too high. Uptake rate of PAS for GEM has increased according to time. But in case of PAS for GOM didn't work properly. PAS for GEM also has good correlation with AAS (Tekran 2537). Sampling rate was estimated 0.094~0.108 m^3 day^{-1}. Sampling rate correlate with wind speed and temperature but humidity couldn't find any correlation with sampling rate.

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PT-093 [환경]

Dry deposition flux of gaseous oxidized mercury(GOM) and particulate bound mercury(PBM)

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Mercury(Hg) is a toxic pollutant of concern throughout the northern hemisphere. Atmospheric Hg is often emitted as inorganic forms: however once inorganic Hg is deposited into aquatic ecosystems it can be transformed into MeHg, the most toxic from, Therefore, the quantification of Hg atmospheric deposition is critical in order to evaluate the Hg transformation and transport mechanisms, and further to reduce MeHg levels in environment. Among atmospheric inorganic Hg species, gaseous divalent form (GOM) and particulate form (PBM) are considered to be very important with respect to deposition processes including dry and wet deposition. However, it is hard to say that a reliable sampler for measuring Hg dry deposition flux has been developed.

In this study, the atmospheric concentrations of GOM and PBM were measured using KCl coated denuder and quartz fiber filter, respectively. Concurrently, a kife-edge surrogate surface using cation-exchange membrane and quartz fiber filter was deployed as a means to directly measure GOM and PBM dry deposition flux, respectively. The measured dry deposition flux was compared with the flux estimated using three-layer resistance model. The average concentration of GOM and PBM were 4.2±1.9 pg m^{-3} and 17.1±14.8 pg m^{-3}, respectively. The average flux of GOM was concurrently measured to be 0.11 ± 0.05 ng m^{-2} h^{-1}.

The picture of denuder-base sampling unit for GOM(left) and sampling devices for deposition flux of GOM(right).

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PT-094 [환경]

Determination of phenols in water using GC-MS following acetylation and liquid-liquid extraction

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Phenol occurs in natural water in the range of 0.005 to 5 μg/L and can react with Cl^- and/or NO_2^- ion to form chlorophenols and nitrophenols. In Korea, phenols in groundwater and river are regulated as the maximum concentration level (MCL) of 5 μg/L. In particular, chlorophenols that belong to Group B2 (probable human carcinogen) are a group of water quality monitoring parameters. The method detection limits (MDL) of the U.S. EPA method 604 using liquid-liquid extraction ranged from 0.58 to 2.2 μg/L. This study aimed to lower the MDLs using GC-MS. A water sample (50 mL) was adjusted to pH 2 or less using 6 N HCl solution. To the sample were added 10 g sodium sulfate. Phenols were extracted using 50 mL of methyl *t*-butyl ether (MTBE) by shaking for 15 min (× 2). The extract (100 mL) was dried over ~ 2 g of sodium sulfate and the filtrate was concentrated to dryness using rotary vacuum evaporator followed by N_2 stream. To the concentrate were sequentially added 1 mL of ultrapure water, 0.5 mL of 5% K_2CO_3, and 100 μL of acetic anhydride. The mixture was vortex-mixed and allowed to stand for 10 min. The mixture was shaken for 1 min with 1 mL of *n*-butyl acetate and 0.1 mg of NaCl. The upper layer was dried using 0.1 g of sodium sulfate. One μL of the prepared sample was injected into GC-MS (Agilent DB-5MS column; 30 m × 0.25 mm × 0.25 μm) and quantitative analysis was conducted using EI mode. Spike calibration curves were drawn in the range from 0.3 to 4 μg/L (n = 5) and showed high linearity (coefficients of determination 0.9960-0.9996). The relative standard deviations (RSD) ranged from 4.3 to 9.1% and from 1.5 to 11.9%, respectively, for 0.3 and 4 μg/L levels. The recovery rates were 82.5-114.6% and 80.4-110.8%, respectively (n = 3). The MDLs were estimated between 0.03 and 0.53 μg/L. The established method was applied to field samples collected from Gangneung and Donghae, Korea. Eight phenols (except pentachlorophenol) were detected in surface water samples. Total phenol concentrations ranged from 1.44 to 7.47 μg/L (n = 20).

PT-095 [환경]

Quantitative determination of phenols in fish tissues using GC/MS following solvent extraction and acetylation

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Phenols can cause acute toxicity such as necrosis or death to fish at mg/kg level. This study was intended to establish an analytical method for quantitative determination of phenol, chlorophenols, and nitrophenols in fish tissues. To one gram of a homogenized tissue sample were added 100 μL of 12 N H_2SO_4 solution, 3 g of sodium sulfate, and 15 mL of ethyl acetate and the mixture was sonicated for 30 min. The extract was centrifuged at 9,500 rpm for 10 min. This extraction procedure was repeated one more time. The collected extract was dried over 3 g of sodium sulfate and concentrated to dryness using the rotary vacuum evaporator followed by nitrogen stream. To the concentrate were added 1 mL of ultrapure water, 0.5 mL of 5% K_2CO_3, and 100 μL of acetic anhydride. The mixture was vortexed for 20 s and allowed to stand for 10 min. The mixture was shaken with 1 mL of *n*-butyl acetate and 0.1 mg of NaCl for 1 min. The upper layer was separated and dried over 0.1 g of sodium sulfate. One microliter of the prepared sample was injected into GC-MS and quantitation was performed using the EI mode. The column used was Agilent DB-5MS (30 m × 0.25 mm × 0.25 μm). Calibration curves which were prepared in the range of 20 to 200 μg/kg (n = 5) showed good linearity (coefficients of determination 0.9960-0.9991). Repeatability and reproducibility were evaluated as relative standard deviations (RSD, n = 3) for 20 and 200 μg/kg levels, which ranged from 0.50 to 10.8 %. Recovery (n = 3) rates for the two levels ranged from 72.9 to 110 % and 61.2-107 %, respectively. Method detection limits (MDL) were estimated at 4.1-12.3 and 13.0-39.0 μg/kg, respectively. Analyses of fish samples collected from Gangneung and Donghae, Korea showed that eight kinds of phenols were detected in fish tissue samples. Total phenol concentrations in the samples varied in the range 95.6-328.0 μg/kg (abdominal muscle, n = 8), 188.0-288.4 μg/kg (gill, n = 7), 50.9-259.2 μg/kg (liver, n = 6), and 18.2-300.0 μg/kg (kidney and tubules, n = 6). Application of the established method can be extended to the analysis of phenols in other similar biological tissues.

PT-096 [환경]

Nationwide concentration distributions of *N*-nitrosamines and secondary amines in chlorinated drinking water

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This study aimed to investigate the concentration distributions of highly carcinogenic *N*-nitrosamines (NAs) and their organic precursors, secondary amines (SAs) in chlorinated drinking water collected from nationwide 41 sites in Korea. NAs in each water sample (adjusted to pH 6.0, 500 mL) was concentrated onto the Carboxen 572 sorbent (2.0 g). After drying the cartridge, the NAs were eluted with a mixture of dichloromethane and methanol (95:5, v/v) and the eluate was analyzed as their dansyl derivatives using HPLC-FLD. Analysis of SAs was performed in the following order: derivatization with benzenesulfonyl chloride, solvent extraction, concentration, and instrumental determination using GC-MS (EI mode). QA/QC results for both chemical groups were very satisfactory. Detection rates of *N*-nitrosodimthylamine (NDMA) and *N*-nitrosodiethylamine (NDEA) among the NAs were 100% and 70.7%, respectively. The average concentrations of the two NAs were 45.3 ± 22.6 and 5.50 ± 5.25 ng/L, respectively. The average concentration of NDMA in the winter for the whole samples was higher than that in the summer (55.0 ± 20.5 ng/L vs. 35.5 ± 20.5 ng/L) and statistically significant (p = 0.001). The average NDEA concentration was higher in the summer than in the winter (6.50 ± 5.94 ng/L vs. 4.50 ± 4.30 ng/L), but there was no statistical difference between the two seasons (p = 0.084). The dimethylamine (DMA) and diethylamine (DEA), precursors of NDMA and NDEA, were found in all the water samples. However, seasonal difference of their concentrations was not observed (0.83 ± 0.38 μg/L in the summer and 0.76 ± 0.33 μg/L in the winter). Regional differences in the concentrations of NAs and SAs were not found. This study suggested that high levels of NDMA and NDEA in Korea might be associated with other factors in addition to their organic precursors.

PT-097 ［환경］

Development of an improved method for determination of *N*-nitrosamines in drinking water using HPLC-FLD

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In this study, a method for the analysis of nitrosamines (NAs) in chlorinated drinking water using derivatization followed by high performance liquid chromatography-fluorescence detection (HPLC-FLD) was developed. A drinking water sample (500 mL) was passed through a Carboxen 572 cartridge (2.0 g) to concentrate NAs, which were eluted from the cartridge using dichloromethane (DCM, 15 mL). The eluate was then reacted with dansyl chloride prior to HPLC analysis. To optimize the analytical method, the following factors were considered: 1) effect of water pH on cartridge concentration; 2) Carboxen 572 cartridge drying; 3) selection of eluents, and 4) removal of secondary amines (SAs) in the eluent prior to derivatization. The optimum water pH value was 6.0. Cartridge drying under vacuum with a silica gel trap was more efficient than with nitrogen stream (4 times). A mixture of DCM and methanol (95:5, v/v) was chosen as a better eluent than DCM only, which has been mostly used conventionally. The concentrated eluent was washed with 0.1 N aqueous HCl solution (5 mL) before the derivatization, which resulted in the decrease SAs (~ 80 %). The recovery of NDMA was estimated at 90.5 %. Coefficients of determination (r^2) of calibration curves for NAs quantitation were 0.996 or higher. An accuracy test using a Certified Reference Material showed a relative percent difference (RPD) of 7.14% and a relative standard deviation (RSD) of 0.35% for NDMA and NDEA. The RSD values for repeatability was estimated at 2.81 % and 11.1 %, respectively for the two NAs and the method detection limits (MDL) were 0.23 ng/L and 0.31 ng/L, respectively. This improved method can be applied to the quantitation of NAs in surface water as well as drinking water.

Synthesis and application of Sm_2O_3 nanoparticles as a tracer for environmental contamination source

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Rare-earth metal oxide nanoparticles can be used as a tracer for a source of water contamination in the environment [1]. Rare-earth metal oxide nanoparticles are usually harmless to the environment and exist in ultra-minimum quantity in the Korean peninsula [2]. The identification (e.g., elemental analysis) of the rare-earth metal oxide nanoparticles is relatively simple as they usually show characteristic γ-ray emission spectra by the radioactive isotopes.

In this study, rare-earth metal oxide nanoparticles of Sm_2O_3 were synthesized by a sono-chemical method. Then the particle size and its distribution were analyzed by dynamic light scattering (DLS), scanning electron microscopy (SEM), and asymmetrical flow field-flow fractionation (AsFlFFF). The chemical composition of the Sm_2O_3 nanoparticle was analyzed using an energy dispersive X-ray spectroscopy (EDX), X-ray powder diffraction (XRD) and inductively coupled plasma mass spectrometry (ICP-MS). AsFlFFF results showed the Sm_2O_3 nanoparticles have sizes ranging 20 ~ 30 nm with relatively uniform size distributions, which is desirable as a tracer for contamination source.

The Sm_2O_3 particles were injected into goldfishes through the mouth, and allowed the goldfishes to live for 7 more days. Then the goldfishes were dissected, and the concentrations of the Sm_2O_3 particles in 9 different internal organs were analyzed using ICP-MS. The highest concentration of 20 μg/g was observed in the intestine.

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PT-099 [환경]

Chemical compositions of atmospheric aerosols in relation to meteorological phenomena at Gosan Site, Jeju Island

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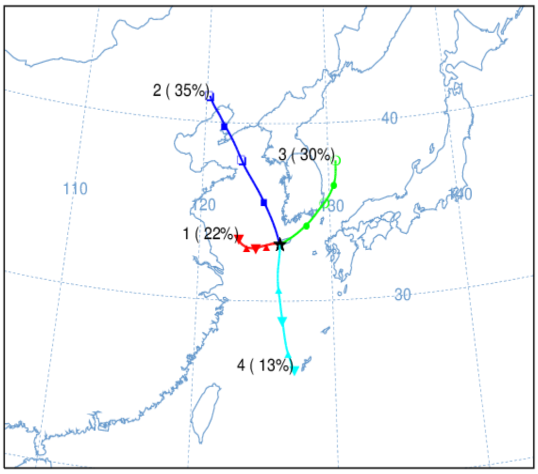
In order to examine the variation characteristics of chemical compositions in accordance with the different meteorological conditions, PM_{10} and $PM_{2.5}$ were collected at Gosan site of Jeju Island during 2013~2015, and then their ionic and elemental species were analyzed. The concentrations of nss-SO_4^{2-} and NH_4^+ were respectively 6.5 and 4.7 times higher in fine particle mode ($PM_{2.5}$) compared to coarse particle mode ($PM_{10-2.5}$), however NO_3^- concentration was 2.4 times higher in coarse mode compared to fine particle mode. During Asian dust days, the concentrations of nss-Ca^{2+} and NO_3^- increased highly as 8.2 and 5.0 times in PM_{10} particle, and 3.5 and 6.0 times higher in $PM_{2.5}$ particles, respectively. For the haze days, the concentrations of secondary pollutants increased 3.1~4.7 and 3.2~7.9 times in PM_{10} and $PM_{2.5}$ particles, respectively, and they were 1.2~2.1 and 0.9~2.1 times, respectively, during the mist days. The aerosols were acidified largely by sulfuric and nitric acids, and neutralized mainly by ammonia in fine particle mode during the haze days, but neutralized calcium carbonate in coarse particle mode during the Asian dust days. The clustered back trajectory analysis showed that the concentrations of nss-SO_4^{2-}, NO_3^-, and NH_4^+ were relatively high when the inflow pathway of air mass was from the southern part of China.



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PT-100 ［환경］

Development of DNA-based assessing method for mold in dust of dwellings, Korea

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Much scientific evidence indicates a positive association between moldy environments and respiratory illnesses and/or symptoms. However, few comprehensive assessments of mold have been performed in such settings. Even spore counts or microscopic enumeration only may not be sufficient for evaluating fungal exposure. Recently, Mold Specific QPCR technology developed by US EPA (Environmental Relative Moldiness Index, ERMI) has been widely used worldwide, and their great performance for assessing fungal exposure has been shown. We aimed to develop the Korean version of ERMI attributed to the distribution of fungal flora in Korea.

Thirty dwellings in Seoul and Incheon area were selected for sampling, and each was classified into ‘Flooded, ‘Water-damaged’ or ‘Non water-damaged’. Dust on floor and airborne sampling were performed using MAS100 and ‘Dustream’ collector. Samples were analyzed by quantitative polymerase chain reaction (QPCR) for the 36 molds belonged to ERMI. Student *t*-test and ANOVA tests were carried out using SAS program.

The median ERMI values of flooded, water damaged, and non-water damaged dwellings were 8.24(range: -5.6 to 27.9), 5.47(-25. 4 to 32.7), and -15.30(-24.6 to 14.8), respectably. Significant differences were observed between flooded and non-water damaged dwellings (P=0.001) and between water-damaged and non-water damaged dwellings (P=0.032).

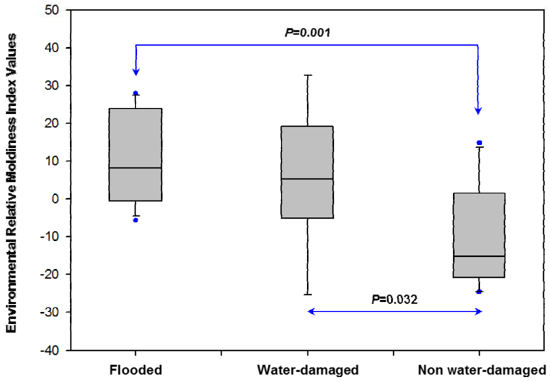

FIG. 1. The boxplot results of ERMI values for flooded, water damaged, and non-water damaged dwellings

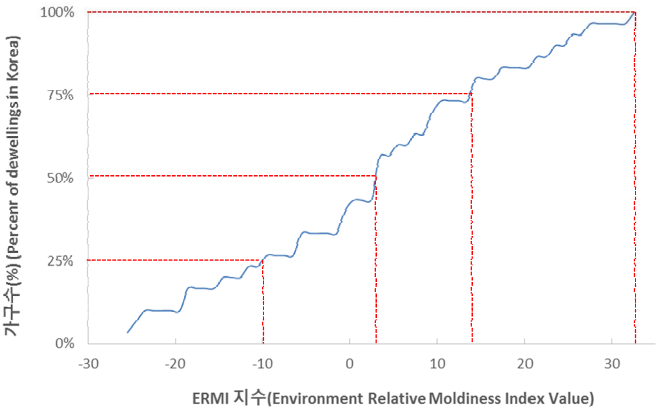

FIG. 2. Relationship of ERMI values with percentage of dwellings in Korea

Our findings indicate that ERMI values attributed to dust samples in Korea could be applicable for identification of flooded or water damaged buildings. Rather, much data are necessary for developing Korean version of ERMI values continually.

PT-101 [환경]

Identifying for the leaching characteristics of heavy metals from Ferronickel Slag(FNS)

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Ferronickel slag (FNS) generated from the ferronickel (a raw material of stainless steel) production industry is a physically good alternative for aggregate, but it contains some of the (hazardous) heavy metals originating from ores. These chemicals inside the slag may release into the soil or underground water during recycling it as a fill material or horizontal drain, which can increase the pollution level in this area. To identify safe and stable recycling of FNS, it needs to survey the leaching characteristics of heavy metals from FNS. This study aims to determine the exposures of the potential environmental pollutants from ferronickel slag by using three leaching tests: the Korean official test method on waste, TCLP, and SPLP and to estimate the long-term leaching behavior of these pollutants by using percolation leaching test. Finally, we compared the leaching test results with the criteria of various environmental compartments (e.g., soil, underground water, and waste) to identify safe and stable recycling of FNS.

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PT-102 ［환경］

Occurrence of DDTs and PCBs in the eggs of black-tailed gulls (*Larus crassirostris*) inhabiting different Korean coastal ecosystems

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It is known that persistent organic pollutants (POPs), including DDTs and PCBs are biomagnified up the food chain due to their lipophilic and persistent features [1]. The present study compared DDTs and PCBs concentration levels in Korean coastal ecosystems using the eggs of black-tailed gulls (*Larus crassirostris*) that are at the top of tropic levels feeding various fishes near shore. The black-tailed gull eggs were collected from Baengnyeongdo (West Sea), Hongdo (Southern Sea), and Ulleungdo (East Sea) in 2016. As a result, the level of DDTs was the lowest in the eggs of Hongdo showed the lowest concentration of 118 ng/g wet, compared to that of Ulleungdo (230 ng/g wet) and Baengnyeongdo (232 ng/g wet). The concentration of eggs from Ulleungdo (71.72 ng/g wet) was highest, whereas those of Hongdo and Baengnyeong recorded relatively low concentrations of 22.2 ng/g wet and 8.22 ng/g wet, respectively. The occurrence of POPs in the eggs is closely related to biomagnification through the food chain around the breeding sites, of which environment is inevitably affected by nearby on-land activities. Continuous collecting the eggs for the retrospective analyses will therefore offer the chance to control existing and emerging pollutants for the future.

Key words: Black-tailed gull (*Larus crassirostris*), Eggs, Persistent organic pollutants (POPs), DDTs, PCBs

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PT-103 [환경]

Environmental behavior of hexabromocyclododecane in Korean and Japanese rivers

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Hexabromocyclododecane (HBCD), a kind of persistent organic pollutants (POPs), has been reported at environmental compartments from various sources (e.g., polystyrene foams, textile products etc.) for decades. Notwithstanding the increase in number of monitoring studies of HBCD, few have attempted to characterize and identify its degradation products and enantiomeric patterns in the aquatic environment. Since there are some evidence that degradation products have higher binding affinities to human transthyretin receptor (hTTR) than parent HBCD and even thyroxin, it is necessary to examine those surveys extensively. The purpose of this study is to offer not only monitoring data of HBCD, but identification of its enantiomers and derivatives in river sediments which were collected from Korean and Japanese rivers highly contaminated by HBCD. HBCDs were detected in 10 surface sediments with concentrations ranging from 0.087 to 7.9 ng g^{-1} dry weight from two rivers in Korea. On the other hand, HBCDs were detected in all surface sediments gathered from the three rivers in Japan, with concentrations ranging from 1.0 to 1500 ng g^{-1} dry weight.

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PT-104 [환경]

Mercury containing solid waste analysis using direct mercury analyzer

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In a mercury leaching test for waste in Korean Standard Method(ES 06404-1), pre-treatment process of elute is very complicated with a high possibility of contamination and low mercury rate. It is also difficult to analyze multiple samples in a short time. Direct Mercury Analyzer applying thermal decomposition gold-amalgamation analysis has been recently used. The method shows a high recovery rate for solid waste without complicated pre-treatment in a short time.

Three solid waste samples and four CRMs were analyzed using Direct Mercury Analyzer(MA-3000, NIC, Japan). Spent fluorescent lamp glass, dust and Aluminum cap generated from recycling facility were collected and four CRMs(Loam soil, Inorganics in marine sediment, Industrial sludge, Marine sediment reference) were obtained. The highest Hg contents from dust detected 1.606 mg/kg and the lowest Hg contents from fluorescent lamp glass detected 1.398 mg/kg. Hg detected from Loam soil, Inorganics in marine sediment, Industrial sludge and Marine sediment reference are, respectively, 0.083, 0.4474, 1.10 and 0.091 mg/kg. Four Certified Reference Materials deviation were in the range of 0.002~0.015 and satisfied the certified concentration ranges.

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PT-105 [환경]

Flammability analysis of spent organic solvents

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In order to measure the flammability, forty-three spent organic solvent and four wastewater samples were collected. The analysis of the samples was carried out by applying the Korean waste official test method (ES 06802.2). According to this test method, the determination of flammability in liquid waste is temperature. The flammable liquid mean a liquid having a flash point of ≤ 60.5℃ for closed test method and ≤ 65.5℃ for open test method. As the result, twenty-seven of the spent organic solvents were flammable waste, and only one wastewater showed flammability. Flammable liquid were mainly discharged from chemical and pharmaceutical facilities. The kinds of main detected solvents were mixtures of toluene, methanol, acetone, DMF, MEX, and so on. The measured flash points were showed various ranges between 2~100℃. Therefore, liquid waste with low flash point need to proper management.

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PT-106 [환경]

A study on guideline for effective operation and safety management of air dome-typed landfill facilities

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Even though Air dome-typed landfill facilities can reduce leachate from wastes and civil complaints, there are high concerns about the risks like fire because of the reactive wastes inside this place.

In this point of view, this study has conducted the onsite investigation on the current operational problems and management system of this waste. Seven air dome-typed landfill facilities are monitored by conducting the interview with facility manager, questionnaire survey, and review of the concentration results of wastes. The questionnaire was prepared with the priority of the experience of workers, the management system of safety, and the health care status of workers. We also examined the retained guidelines on environmental and safety management, a kind of importing waste, and the general information of these facilities. On the basis of this study, we suggested the new operational guideline of the air dome-typed landfill facility and the safety criteria of these wastes for more appropriate management of these facilities.

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PT-107 [환경]

Monitoring surveys for heavy metal from ordinary portland cement

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A variety of wastes such as cinder, sludge from wastewater treatment, and waste synthetic resin etc. are being used as an auxiliary/alternative fuel in the cement industry.[1] However, these wastes can cause environmental pollution in the process of recycling. [2]Under the current circumstance, the level of Cr^{6+} in the cement products is under controlled in less than 20 mg/kg of concentration value through the autonomous agreement between the Ministry of Environment and the industry of cement. Also, the level of six heavy metals: Cu, Cd, Pb, As, Hg, and Cr^{6+} in these wastes has been monitored to ensure compliance.[3]

In this study, the distribution of heavy metals from the cement products was analyzed from 2009 to 2016. As a result of this study, the average concentrations of Cr^{6+}, Cu, Pb, As, and Hg were 7.85 mg/kg, 95.66 mg/kg, 53.89 mg/kg, 11.51 mg/kg, and 0.05 mg/kg, respectively. In case of Cr^{6+}, no industry exceeding concentration value of 20 mg/kg over the last 5 years has been investigated.

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PT-108 [환경]

A study on possibility to thermal treatment for SCCPs and OCPs containing waste.

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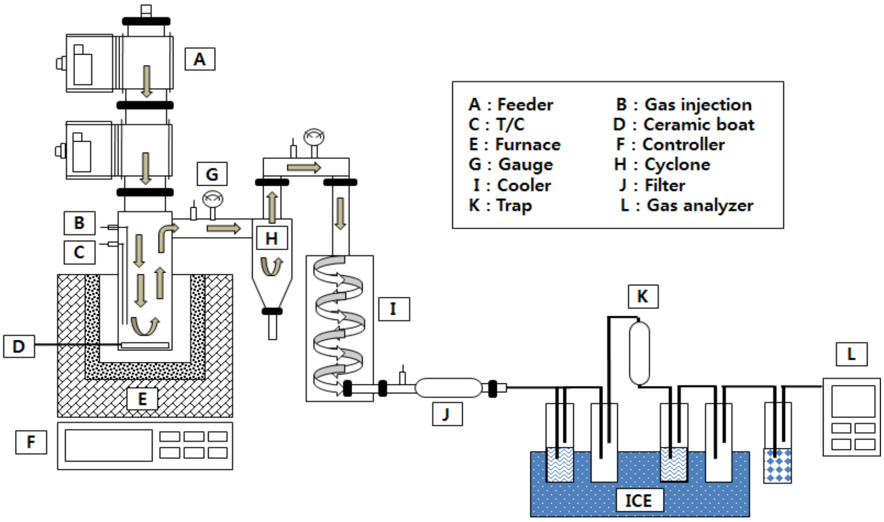
The Stockholm Convention is an agreement to reduce POPs use, production and emissions. POPs are highly toxic substances and can not be decomposed in their natural state. Through the food chain, animals are accumulated in the plant body. It has the characteristic of long distance movement. Korea is a party to the Convention and has a duty to pursue the management of emission sources in accordance with the National Implementation Plan. In addition, a national implementation report on the efforts to restrict POPs production, distribution, and use and the emission status should be prepared.

In Korea, it is necessary to systematically respond to the changing international POPs regulations and to prepare a long-term plan for efficient emission reduction measures. The purpose of this study is to evaluate the environmental stability of the thermal treatment of the sample through the Lab-scale incinerator and to propose a standard for waste incineration applicable in Korea.

The target samples consisted of a cell phone case made of cloth and leather, a flame retardant rubber sheet, a polyurethane foam, a cell phone case made of silicone, and a pesticide liquid phase and a solid phase.

In this study, foundation analysis of sccps containing wastes and organic chlorinated pesticides waste were analyzed and thermal characteristics were analyzed.



PT-109 [환경]

Emission characteristics of PCDDs/DFs from medical waste incinerators

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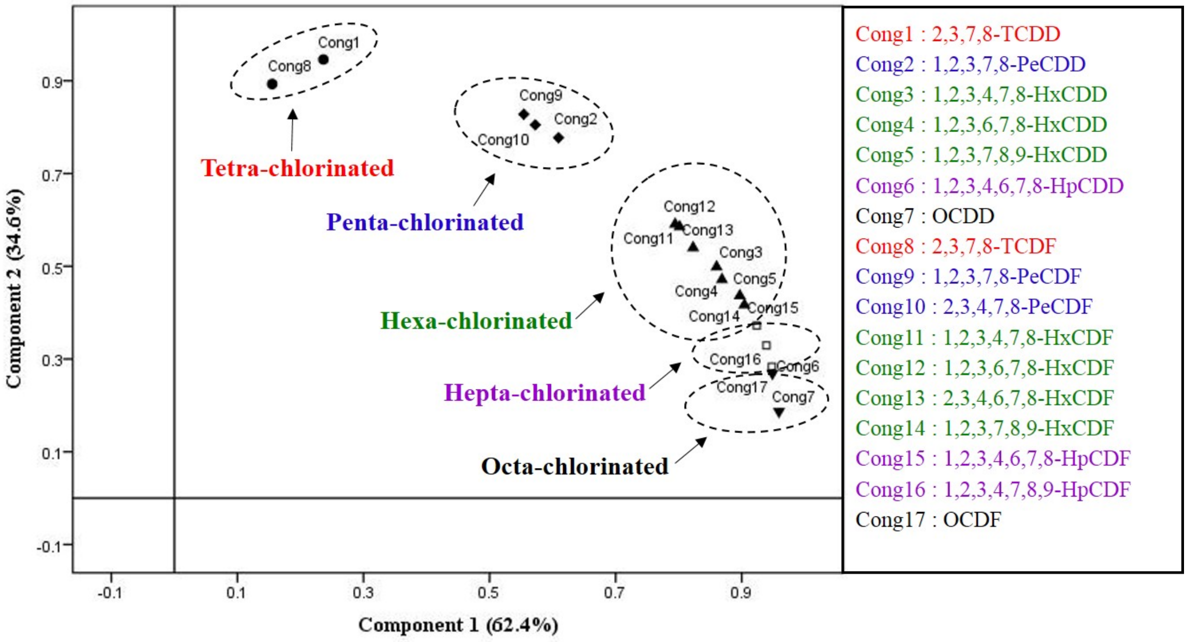
Toxic polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) in 45 stack gas samples were measured from 19 medical waste incinerators in South Korea using high-resolution gas chromatography equipped with a high-resolution mass spectrometer. The average concentrations of the sum of 17 toxic PCDD/PCDF congeners emitted from the medical waste incinerators ranged from 0.153 to 101.9 ng/Sm3. Based on the World Health Organization toxic equivalency factor, they ranged from 0.007 to 5.437 ng-TEQ/Sm3. The congener patterns of PCDDs/PCDFs were described using principal component analysis and presented four patterns. In the evaluation of annual average total TEQ concentrations, outlying stack gas samples were excluded. In this study, the number of chlorine substitutions was evaluated as an important factor in congener patterns. Coefficient of determination values were employed for evaluation of correlation between PCDDs and PCDFs. 1,2,3,4,6,7,8-HpCDF was measured as the most emitted congener, while 2,3,4,7,8-PeCDF was the greatest TEQ contributor.



PT-110 ［환경］

Collection of atmospheric gaseous mercury for stable isotope analysis

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Mercury (Hg) is a toxic pollutant to human and wildlife. Atmospheric Hg plays a important role in the transport and transformation of global Hg cycle emitted from natural or anthropogenic sources, and Hg isotopic ratios provide a fingerprint of various Hg sources for tracking Hg sources. We examined the two collection methods of gaseous Hg for stable isotope. First, we used a carbon trap for collecting total gaseous Hg and desorbed Hg from active carbon by two furnace system. Desorbed Hg was collected in 1 % $KMnO_4$/ 10 % H_2SO_4 solution. Second, Ontario-Hydro (impinger collection) method was modified for speciated gaseous Hg (Hg(II), Hg(0)). Gaseous Hg was generated by spiking Hg isotope standard reference material (NIST SRM 3133) to $SnCl_2$ solution. It was developed high recovery rate and low mass variation at 10 L/min flow rate of Ontario-Hydro method, but the results showed that mass fractionation would be occurred during mercury collection depending on collection condition such as flow rate and Hg concentration. Our study suggests that the conditions of collection methods should be optimized to improve the recovery rate and minimize the mass fractionation of total and speciated Hg isotope.

PT-111 [환경]

The variation of magnesium isotopic composition in carbonates by diagenesis process

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Although magnesium (Mg) isotopes has been widely used in recent years to determine the origin and diagenetic histroy of marine carbonates in paleo environments, there were no scientific information on Mg isotopes for the Cambrian carbonates. Here, we measured Mg isotope compositions of carbonates in the Machari Formation that was deposited at carbonate ramp of the middle to late Cambrian age and suffered various diagenesis process. All samples are categorized by four four petrographic components (limestone I and II, dolomitic limestone, and dark gray calcareous shale) and separation of limestone I and II is possible by portion of microsparry (crystal sizes≤20μm) and sparry (crystal sizes≥20μm) calcite. Wide range of both limestone I and II (-2.69 to -1.00‰ in δ^{26}Mg) indicate that limestone was sensitive by diverse diagenesis with ^{87}Sr/^{86}Sr and Mn/Sr ratios. Heavy δ^{26}Mg values in dolomitic limestone (-1.30±0.32‰, 2σ) were effected by dolomitization and not altered by post diagenesis due to fast Mg isotopic fractionation. The results of the Machari Formation can predict that Mg isotopic composition in the Cambrian seawater may be heavier because heavier average of δ^{26}Mg value (-2.04±0.88‰, 2σ) in limestone samples is heavier than that (-3.60±0.50‰, 2σ) in Moicene limestone. In addition, the estimated δ^{26}Mg value in the Cambrian seawater is consistent with Mg fractionation factor for dolomitization (0.9980 to 0.9975). This study suggest that Mg isotope in carbonate is useful tool for interpreting paleo environment of seawater despite the various diagenesis.

PT-112 [환경]

Analytical methods for hexabromocyclododecanes in comsumer products

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Hexabromocyclododecanes (HBCDs) are a cyclo-aliphatic produced by the bromination of cyclododecatriene, consisting of 16 possible isomers. They are used as flame retardants in thermal insulation building materials, upholstery textiles and electronic devices and released into the environment from consumer products during their production, use or disposal. To evaluate the extent of exposure to HBCDs from consumer products, the analytical methods for HBCDs are needed. However, International Official Test Methods for HBCDs in consumer products are not established. In this study, analytical methods of HBCDs (α, β, γ -HBCD) in consumer products (PCB board, insulting tape, tent sheet, insulation and redinforced plastic) were determined through QA/AC. Pre-treatment of HBCDs in comsumer products were analyzed using soxhlet extraction and SPE purification and they were quantified by LC/MS/MS. The method detection limit (MDL) and the limit of quantitation (LOQ) showed a range of 0.136 ng/g ~ 0.290 ng/g and 0.434 ng/g ~ 0.924 ng/L for PCB board, 0.120 ng/g ~ 0.314 ng/g and 0.382 ng/g ~ 0.999 ng/L for insulting tape, 0.284 ng/g ~ 0.767 ng/g and 0.904 ng/g ~ 2.439 ng/L for tent sheet, 0.581 ng/g ~ 1.322 ng/g and 1.849 ng/g ~ 4.206 ng/L for insulation, 0.101 ng/g ~ 0.282 ng/g and 0.323 ng/g ~ 0.897 ng/L for reinforced plastic. The recovery rates showed a range of 86.1 % ~ 95.9 % in comsumer products and the relative standard deviation (RSD) ranged less than 7.93%.

PT-113 [환경]

Separation characteristics of perfluorinated compounds in different cartridge types using LC-MS/MS

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Under the Stockholm Convention, perfluorooctane sulfonic acid (PFOS) and it salts and perfluorooctane sulfonyl fluoride were listed in Annex B. Also, perfluorooctanoic acid (PFOA) is a newly emerging material of concern. Hydrophilic Lipophilic Balanced (HLB) and Weak Anion eXchange (WAX) cartridges were compared to optimize the separation efficiency of perfluorinated compounds (PFCs) including them and analyzed using Betasil C_{18} column and TSQ Quantum Ultra LC/MS/MS. The analysis compounds were 13 perfluoroalkyl carboxylic acid including PFOA, 4 perfluoroalkyl sulfonates including PFOS and 5 precursors of these substances. An experimental method was based on the POPs National Standard Method (ES 10375.1) applicable to rivers and lakes. The method detection limits (MDLs) of PFCs in HLB and WAX ranged from 0.005 to 0.032 ng/L and 0.006~0.026 ng/L, respectively. As a result, 13 perfluoroalkyl carboxylic acid in HLB cartridge and 4 perfluoroalkyl sulfonates in WAX cartridge showed more efficient extraction

PT-114 ［환경］

Improvement of organochlorine pesticides analysis method using tandem cleanup method

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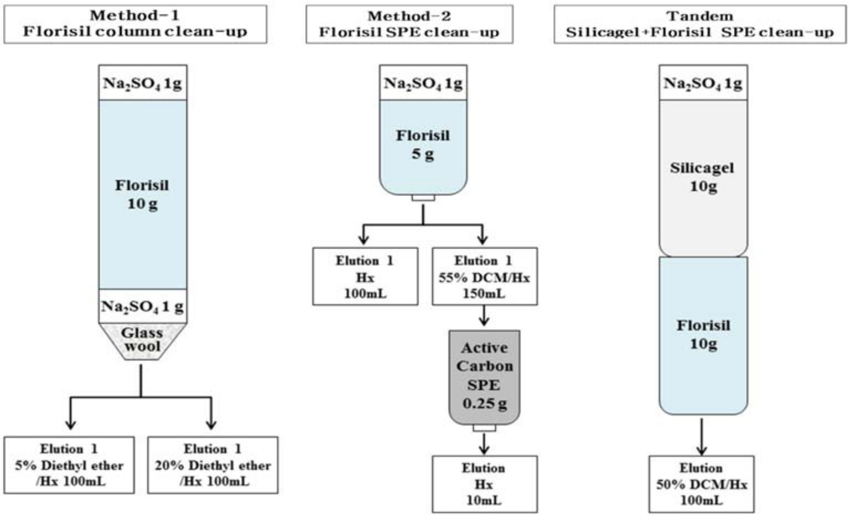
Organochlorine pesticides (OCPs) have been in wide usage across the world to control agricultural pests. Because of the stable chemical structure of OCPs, they have characteristics of persistence, bioaccumulation and long-distance transportation. These pesticides not only cause serious diseases in humans but also are highly toxic to the ecosystem. Though they are already banned, the monitoring is necessary to implement efficient management. Regarding the pretreatment of OCPs, the existing standard methods for persistence organic pollutants (POPs) have a limited cleanup capacity, consume large volumes of solvent and take a long time before samples are concentrated. This study was performed to simplify the existing standard methods for POPs by reducing the test time and the amount of solvent used. In this study, a silicagel SPE cartridge and a florisil SPE cartridge were connected in tandem and then the samples were cleaned up using 50% dichloromethane/hexane 100 mL. As a result, the accuracies were almost the same as those achieved by the existing method, while the amounts of solvent used and test time were three times lower. In addition, the coloring substances and polar substances in the samples were efficiently cleaned up, which enabled a stable instrumental analysis.



PT-115 [환경]

Characterization of the background content of Mn and Se in selected groundwater considering geology in south korea

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In this study, the detection frequencies, longitudinal changes, distribution characteristics in various geology and soil were examined and deducted natural background levels in various geology in about 100 non-drinking groundwater samples. The standard limit of the manganese and selenium only regulated in the drinking water in Korea as 0.3 mg/L and 0.01 mg/L, respectively, and in the Switzerland, the standard limit of manganese and selenium in the non-drinking groundwater are 0.05 mg/L and 0.005 mg/L, repectively. The ICP-OES and ICP-MS for the analysis of manganese and selenium were used and the quantitative limits of manganese was 0.0005 mg/L, and the range of the accuracies and precisions of the measurement equipment were 107.4% and 0.9%, repectively and the quantitative limits of selenium was 0.0004 mg/L, and the range of the accuracies and precisions of the measurement equipment were 91.5% and 6.9%, repectively The range and average of manganese in total monitoring sites were 0.001~2.675 mg/L, 0.083 mg/L, and and the range and average of selenium were 0.0004~0.0041mg/L, 0.0004 mg/L. The average of manganese and selenium in various geologies were 0.051 mg/L, 0.0005 mg/L in igneous rock, 0.114 mg/L, 0.0003 mg/L in metamorphic rock, 0.139 mg/L, 0.0003 mg/L in sedimentary rock, respectively. The natural background levels were examined using pre-selection method that remove from the initial dataset samples which are affected anthropogenic inputs(higher than 10 mg/L of nitrate) from the initial dataset, and the natural background levels of manganese and selenium in various geologies were 0.084 mg/L and 0.0010 mg/L in igneous rock, 0.460 mg/L and 0.0008 mg/L in metamorphic rock, 0.236 mg/L and 0.0010 mg/L in sedimentary rock, respectively.

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PT-116 ［환경］

Analyzing the cell toxicity caused by cetylpyridinium chloride

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Cetylpyridinium chloride (CPC), known as a quaternary ammonium salt, is categorized as cationic surfactant. They are widely used in toothpaste, mouthwashes, throat sprays, breath sprays, nasal sprays and lozenges as an antiseptic. Due to the previous studies, CPC is reported to be orally toxic to rats, mice and rabbits and can cause severe eye irritation. As the effect of CPC to the adenocarcinomic human alveolar basal epithelial cell (A549) is not yet reported, we focused on the cytotoxicity of CPCs to A549 cells. A549 cells were treated with 0 – 20 μg/mL CPC and were incubated for 24h. The cell viability measured by MTT significantly decreased due to CPC treatment from 3 μg/mL dose dependently, and LDH leakage increased significantly from 8 μg/mL. Neutral red was also tested and showed significant dose dependent decrease to CPC treatment. Clonogenic assay with A549 was held in 6 well plates treated with 0 – 3 μg/mL CPC, and incubated for 7 days. Cell size and number decreased dose dependently and no cells were able to survive from the dose of 0.5 μg/mL. The effect of various cytokines were measured, and the proinflammatory cytokines such as IL-1α and TNF-α increased significantly when exposed to CPC in a dose dependent manner from the dose of 6 μg/mL and 7 μg/mL respectively. Meanwhile, CPC exposure showed no change for IL-6, and IL-8 showed significant increase from 0.1 to 1 μg/mL, and gradually decreased from 2 μg/mL.

PT-117 [환경]

Cytotoxicity and inhibition cell growth assessment in lung epithelial cell A549 of cinnamaldehyde

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Cinnamaldehyde(CA) was isolated from cinnamon essential oil in 1834 by Dumas and Peligot. It is used in some perfumes of natural, fungicide and air freshener in household products. In particular of aerosol household products can be inhalation exposure of while daily activities. Therefore, the purpose of this study was to inhalation toxicity screening as evaluated cytotoxicity and inhibition cell growth of CA. A549 cells were treated with CA at final concentration of 1, 5, 10, 12.5, 15, 20, 25, 50, 100, 1000, 5000 μg/ml for 24hours and 0.05, 0.1, 0.2, 0.5, 0.75, 1μg/ml for 7days in 37℃ incubator, respectively. CA increased in a dose-dependent manner level of LDH leakage and reduced cell viability at end of treatment. Also, CA inhibited cell growth in the clonogenic assay. These result suggested that CA may disruption of function and inhibition cell growth in the lung epithelial cell.

PT-118 [환경]

The effects of cetyltrimethylammonium bromide on cellular toxicity of human alveolar epithelial cell line, A549

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Cetyltrimethyl Ammonium Bromide (CTAB) is one of the quaternary ammonium salts. Due to its property that easily forms micelles in aqueous solutions, it is categorised as cationic surfactant and widely contained various cleaning agents. It is used to antiseptic agent for control bacteria and fungi. In previous study, CTAB can be caused diverse adverse effects such as embryotoxic and teratogenic in rodents. [1] However, association between CTAB and human alveolar epithelial cells is rarely reported. In our study, cytotoxicity of CTABs observed in WST assay and LDH leakage test. A549 cells were treated with CTAB at 0-5000 μg/mL for 24 hours. 5% DMSO treated in A549 cells for vehicle control. In WST assay, cell viability significantly decreased from treated with 5ug/mL to 5000. LDH leakage occurs from 10 μg/mL treatment, but decreased in 5000 μg/mL treated sample. To observe long term toxicity, A549 cells were treated 0 to 1 μg/ml of CTAB for 10 days for clonogenic assay. Number and size of colonies were dose-dependently decreased from 0.2 μg/mL treated well.

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PT-119 [환경]

Water quality trend after introducing the plan of total maximum daily loads in the nakdong river watershed

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Since 2004, Korea has implemented a TMDL(Total Maximum Daily Loads). From 2004 to 2010, the target water quality for BOD was set and implemented. From 2011, T-P is added to the target water quality. We conducted water quality monitoring simultaneously with policy implementation. Based on the observed water quality data, the effect of TMDL was examined. We performed a long-term trend analysis of BOD and total phosphorus (T-P) concentrations at stations of 41 units of the Nakdong River using a nonparametric statistical trend analysis method. The monthly mean values of BOD and T-P concentrations during the period between 2004 and 2015 were analyzed by seasonal Mann-Kendall tests and a locally weighted scatterplot smoother (LOWESS). BOD concentrations showed overall trends of 7.8 % for “downward”, 26.8 % for “upward”, and 65.9 % for “no trend”. Overall, T-P concentrations were 51.2 % and 48.8 % for "no trend" and "downward", respectively. As a result of Principal component analysis (PCA) analysis of the time series flow for the NB-G, T-P in 2004 showed environmental factors in the first quarter and T-P in 2015 showed environmental factors in the second quarter. Thus, we found that T-P is the result of the influence of non-point pollution source in 2004 because rainfall frequency is low in the first quarter, and that T-P is the result of the influence of point pollution source in 2015 because rainfall frequency is high in the second quarter.

PT-120 [환경]

Analysis of nonpoint sources runoff patterns in korean orchards

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Nonpoint source pollutants are discharged during rain event, the volume of effluence is changed in accordance with daily and seasonal conditions. Nonpoint pollution sources are affected by the basin shape and regional characteristics such as climate, topography, land use and soil, thus accurate data on the water quality and flow amount during rainfall events is required to quantify discharge of nonpoint pollution sources. However, since rainfall amount, flow amount and water quality need to be monitored in the rainfall duration to secure survey data for nonpoint source pollutant during rainfall event, integrated survey data for a single land by rainfall characteristics is insufficient due to the difficulty of temporal, budget and personnel support. In this study, quantitative analysis of nonpoint source pollutants by the volume of runoff was carried out using monitoring result of rainfall runoff from orchards on permeable soil. The flushing criteria of initial rain effluent, which had been studied in existing impermeable area including downtown, roadway and bridge, was applied to permeable orchards area to study runoff characteristics of various pollutants and criteria for the amount of first flush. The aim of this study is to provide best management practice for operating management facilities of nonpoint pollution source in permeable area. The runoff characteristic of rainfall effluent, which was produced in orchards area in the rainy event, was analyzed through EMCs, first flush effect, flush ratio and quantification of the flush by pollutant. Also, quantitative effect of changes of rainfall-runoff water on the amount of pollutant runoff was presented with stepwise changes of runoff volume by pollutant. When examined the flush ratio of rainfall runoff using MFFn value, average first flush ratio of SS was the highest of 95.1% at MFF$_{30}$, which means "n"=30, followed by COD 51.9% and T-P 45.9% at the same "n" value.

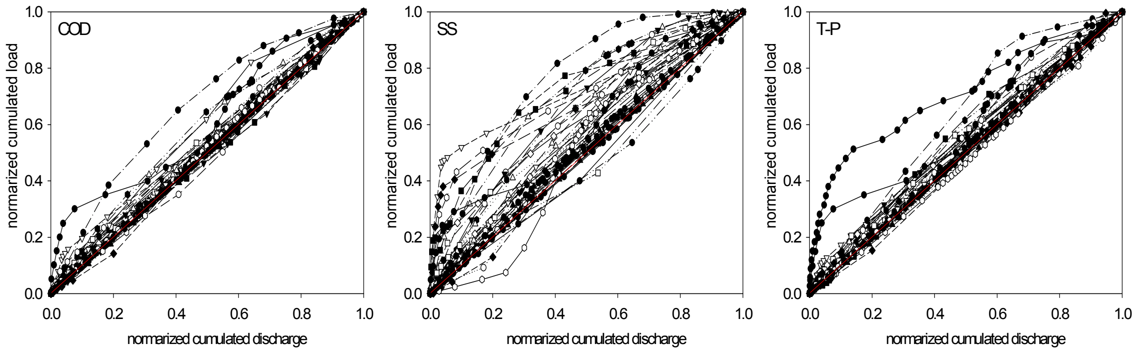

Figure 1.1 Normalized cumulative load curve for variation rainfall events in Korean orchards.

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PT-121 [환경]

Characteristics of nonpoint source pollution in korean roads

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Nonpoint sources pollution can be classified into urban areas, rural areas, natural areas, and aquatic areas depending on the discharge area. Urban areas can be subdivided into residential, commercial, industrial and transportation areas. And rural areas are divided into rice fields, fields and orchards and natural areas are divided into forests and grasslands. In areas with a large increase in impervious area, such as in urban areas, a high concentration of nonpoint pollutants may occur at the beginning of rainfall. Although the reduction of nonpoint sources pollution in urban areas is recognized as an important management plans due to lack of basic data. In this study, the nonpoint source EMCs(Event Mean Concentrations) of roads were calculated and the runoff characteristics were compared using long term monitoring results. From 2007 to 2013, rainfall monitoring for the traffic area was conducted. Subdivided land cover was classified into highway, national road and trunk road and a total of 103 monitoring were performed. In the case of rainfall, the runoff rate of the traffic area was 0.512 which was 0.615 for highway, 0.457 for national road and 0.744 for trunk road. The difference in the runoff rate by road type can be confirmed by comparing the runoff rate. The EMCs was calculated according to the road type(Table 1.1). Rainfall events were classified according to ‘Rainfall Runoff Survey Method in South Korea’. Rainfall data of the surveyed watershed were analysed for the last 10 years.

Table 1.1 EMCs calculation of nonpoint sources pollution by rainfall

Sites	Rainfall (㎜)	BOD	COD	SS	T-N	NH_3-N	NO_2-N	NO_3-N	T-P	PO_4-P
Highway	0~10	3.0	16.8	21.0	2.975	0.292	0.119	0.291	0.206	0.030
	10~30	6.5	15.7	23.0	2.308	0.173	0.064	0.528	0.203	0.024
	30~50	4.8	20.1	16.2	2.482	-	-	-	0.158	0.128
	> 50	3.7	11.5	17.9	1.557	0.118	0.036	0.639	0.127	0.013
National road	0~10	10.0	23.1	14.7	6.055	0.674	0.092	2.064	0.074	0.025
	10~30	4.8	10.2	16.9	2.513	0.188	0.010	0.262	0.101	0.022
	30~50	4.6	11.7	11.0	2.014	0.982	0.094	0.990	0.078	0.031
	> 50	1.8	3.6	12.3	2.440	0.140	0.035	0.608	0.067	0.022
Trunk road	0~10	21.1	108.8	3.3	77.0	10.904	0.785	0.115	2.055	0.401
	10~30	10.9	39.0	3.2	34.2	3.606	0.306	0.052	0.983	0.409
	30~50	19.7	66.6	2.4	70.1	4.341	0.212	0.107	0.514	0.505
	> 50	3.3	8.2	0.6	20.3	1.579	0.217	0.051	0.368	0.290

[1] Deltic A. B. and Mahsimivic C. T., J. of . *Env. Eng.* **123** (1998) 869.
[2] Novotny, V and G Chesters, *J. of . Soil Water Cons.* 44 (1989) 568.
[3] H.G. Kwon, Univ. of Kyungpook National. (2011) .

PT-122 [환경]

Contribution ratio of VOCs emmitted from sanitary pad's Material using the micro scale chamber

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Recently, the carcinogens were detected in sanitary pads. The results of harmful compound emission tests have developed into social problems. The structure of the sanitary pad is composed of a topsheet, SAPsheet, backsheet and hotmelt. Perfumes and dyes can be added to make them more productive. The ingredients and manufacturing process of each material are different.

We checked the VOCs emitted from each material and examined how much VOCs emitted from each material contributes to the VOCs emitted from the sanitary pad.

The emission tests was carried out using the micro scale chamber of the ISO 12219-3 method. The sanitary pad was prepared in six equal halves, and the topsheet, SAPsheet and backsheet were cut into 3 cm x 3 cm length and each of the three specimens was prepared. About 0.07 grams of the hotmelt was prepared by stretching stuck to plate to conduct a emission test. At an average human body temperature of 36.5 ℃, each sample was placed in a chamber cup containing a spacer, purged for 10 minutes, and collected in an adsorption tube filled with 200 mg of Tenax-TA adsorbent for 80 minutes at a flow rate of 50 mL/min.

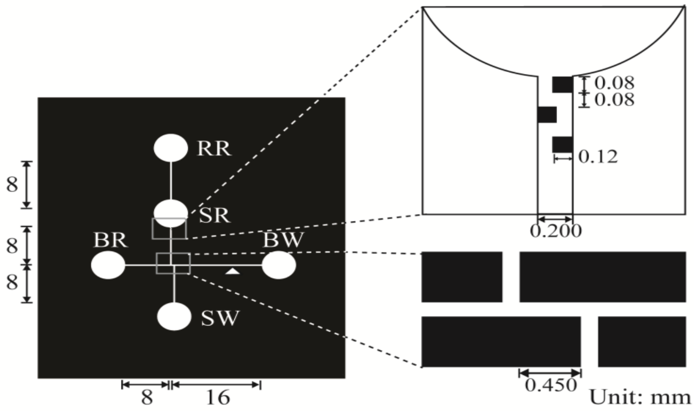
Afeter that, this was analyzed by ATD-GC/MSD and qualitative analysis using Wiley 9 library and quantitative analysis using toluene calibration curve.

This was analyzed by ATD-GC/MSD and qualitative analysis using Wiley 9 library and quantitative analysis using toluene calibration curve.

The chromatograms quantitatively reproduced the VOCs peaks of each material.

The TVOC contribution ratio of topsheet, SAPsheet, backsheet and hotmelt were 0%, 29.8%, 0.4% and 69.8%, respectively. The contribution ratio of hotmelt was the highest.

It is expected that the management of the cause of VOCs emitted from the manufacturing process of the sanitary pad can effectively reduce the VOCs exposed to the human body. In addition, it is necessary to further examine the polar compound emitted from the SAPsheet.



PT-123 ［표준］

Determination of urea in serum by IDMS and the change of certified value according to storage temperature

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An isotope dilution liquid chromatography – tandem mass spectrometry (ID LC/MS/MS) has been established as a candidate reference method for the determination of urea in serum. The verification of this method was accomplished through the analysis of NIST SRM and key comparison. Two levels of serum certified reference material (CRM) were prepared and were certified by ID LC/MS/MS for urea. These CRM were used as sample materials for the proficiency testing. These CRM were also determined by other laboratory through key comparison. The expanded uncertainty in the measurement was approximately 2% within a 95% confidence level. The key comparison showed good agreement, and the results of the proficiency testing showed some bias with the ID LC/MS results. we have also studied the change of certified value according to storage temperature from the disorder of deep freezer.

PT-124 ［표준］

A study on the standardization of test method for TCEP

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TCEP (tris(2-chloroethyl) phosphate) is one of phosphate flame retardants indicating reproductive toxicity. It has been regulated in European Union since 2010 as one of SVHC (substance of very high concern). TCEP is most often used in polyester (PE), polyvinylchloride (PVC) and polyurethane (PU) which is material of cars, toys, furniture, clothing and electrical electronic equipment. However the analytical method of TCEP was not standardized.

Recently analytical test method for TCEP was proposed as Korean Industrial Standard (KS). To validated test method, recovery rate of TCEP was examined for those three matrices, PE, PVC and PU by GC-MS. Polymer sample (0.5 ~ 1) g was extracted by toluene or acetonitrile or tetrahydrofuran (THF) and TCEP 100 μL was added in extraction procedure. Method detection limit and dynamic linear range of TCEP was also obtained. DB-5MS was GC-MS column. Injection volume was 2 μL with splitless mode at 270℃. Initial oven temperature was 100℃ for 2 minute, ramping 15℃/min to 150℃ and 30℃/min to 320℃. Final temperature was 320℃ for 7 minute.

PT-125 ［표준］

Development reference materials for analysis of RoHS 2 candidates

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RoHS was revised in 2011 and 4 phthalates were announced to be included. Furthermore tens of substances were reported as candidate for regulation. Lately, techniques for screening regulated substances in one test were developed for efficient management. To validate the analysis technique, three reference materials (RM) were developed by manufacturing samples and verification. Three custom made polypropylene samples (chip form) were manufactured. One contained polycylic aromatic hydrocarbons (PAHs), tris(2-chloroethyl phosphate) (TCEP), diethyl phthalate (DEP) and tetrabromobisphenol A (TBBPA), and the other two contained deca-brominated biphenyl, diisobutyl phthalate (DIBP), diisononyl phthalate (DINP), diisodecyl phthalate (DIDP), dibutyl phthalate (DBP), benzyl butyl phthalate (BBP), di(2-ethylhezyl) phthalate (DEHP), di-*n*-octyl phthalate (DNOP) and γ-hexabromocyclododecane (HBCD). They were verified by homogeneity test and analysis of variance (ANOVA). The certified value was obtained by reproducibility test using GC-MS.

PT-126 [법과학]

Screening of anabolic androgenic steroids in equine urine couple with gas chromatography-tandem mass spectrometry

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Anabolic androgenic steroids (AAS) is the prohibited drug which makes muscle strong in equine sports. In this research, 15 endogenous & 19 exogenous steroids in the equine urine have been experimented for the analytical method validation. The urine sample spiked with analytes are extracted by solid-phase extraction (SPE) & liquid-liquid extraction (LLE) method, following the Heptafluorobutyric acid (HFBA) derivatization [1]. Continuously, it is analyzed by the selected reaction monitoring (SRM) method of GC-MS-MS. At the result, the 15 endogenous & 19 exogenous targets could all be detected at 1 ng/ml to 50 ng/ml within a fast turnaround time of 15 min.

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PT-127 [법과학]

A study on the effect of blood identification and DNA extraction with urine test strips by alcohols

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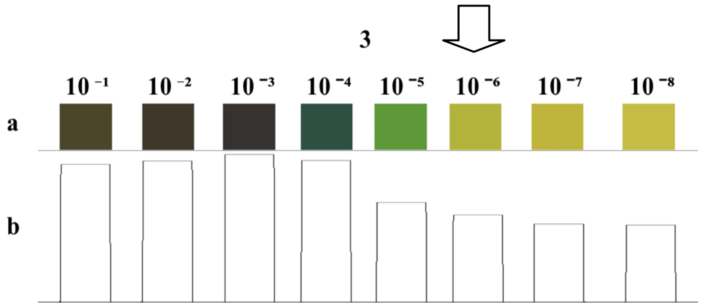
Fast and efficient blood stain presumptive identification has been an important step for setting up an initial investigation direction in crime scenes since it can be used to identify the causal relationship between the source of the blood and the event and/or objects. Recently the use of urine test strip was proposed as presumptive blood testing at crime scenes [1]. It is important to evaluate the blood evidence appropriately through the preliminary test as a key starting point to solve the case because the blood evidence can be found as a mixture with many possible interfering materials.

Therefore, the purpose of this study is to evaluate the influence by alcohols such as soju, beer, and makgeolli on the blood identification, detection limits of diluted blood and the possibility of DNA extraction from urine strips after the test. Also, the images of colored urine test strips after the reaction were analyzed by densitometric image analysis to compare the detection limits with naked eyes. As a result, the blood stain detection limits were different according to dilution order and alcohol types. The detection of blood in saline solution (10^{-6}) was tenfold more sensitive than in sterilized distilled water (10^{-5}). The detection limit of blood in soju (10^{-5}) and beer (10^{-5}) was the same. But the detection of blood in makgeolli (10^{-4}) was tenfold less sensitive. The DNA extraction was possible but the extraction rate was different according to the order of dilution and the type of alcohols. The DNA extraction limit were in the range of $10^{-3} \sim 10^{-4}$.

With further test with other potential interfering materials the urine test strips will be a valuable tool to identify blood and of personal identification with DNA fingerprinting at the crime scenes.



The images and lane profile of the urine strips with blood diluted in soju analyzed using ImageJ, (a) selected lane, (b) lane profile.

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PT-128 [법과학]

Improved development of the aged latent fingerprints with Sodium lactate in silica gel powder treatment before cyanoacrylate fuming:

A preliminary study

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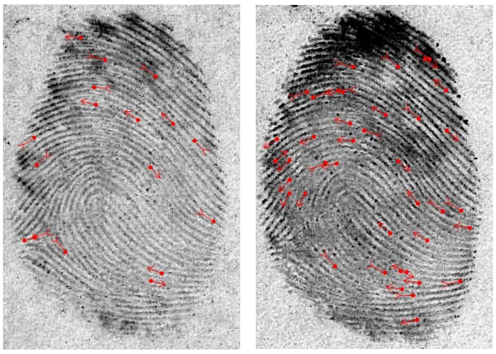
The cyanoacrylate fuming method (CA method) is well known as a primary choice to develop latent fingerprints on nonporous surfaces. However, the CA method shows limited efficiency with aged fingerprints because of the degradation of the lactate ion, the proposed initiator of the CA polymerization [1], and evaporation of water. Therefore, we tested the external treatment of sodium lactate (mixed with silica gel powder) on aged fingerprints (30 days old, 3 depletion series) before CA fuming to improve development efficiency. We analyzed the images of the developed fingerprints after treatment and compared to those of untreated methods by counting the number of minutiae and quantifying the converted area of the ridges with a densitometric image analysis for clarity [2]. The effect of a silica gel powder treatment itself without sodium lactate was minimal. Dusting with a 3:1 silica gel:sodium lactate powder and subsequent CA fuming demonstrated fast, clear, strong and efficient development. We found twice the number of minutia points and larger areas of the ridges in treated fingerprints, compared to non-treated fingerprints. Further study of the mixing ratio with silica gel powder and other carrier powders are needed to qualify a modified CA method that could be used on the aged fingerprints.



Untreated vs. Treated

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[2] J. Cho, H. Kim, M. Kim, S. Choi, *Anal. Sci. Technol.* 29 (2016) 142.

PT-129 [법과학]

A study on the effectiveness of fingerprint lifting from diverse surfaces

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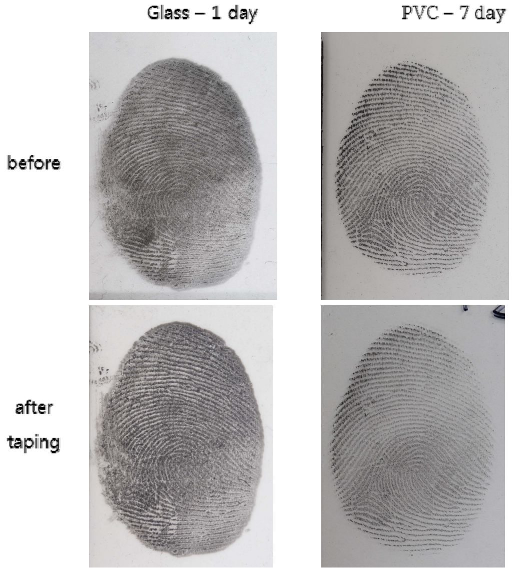
Fingerprint is used to identify suspect(s), victim(s), and crime-related people who have come into contact with objects at the crime scene [1]. After visualization of latent fingerprints the ridge characteristics (minutiae) are extracted and used for identification process. The actual developed fingerprints are lifted with lifting tape for further analysis and storage. Therefore, the effectiveness of the lifting process is very important since the fingerprint can be damaged in the process of lifting. The aims of this experiment were to evaluate the effectiveness of the fingerprint lifting with lifting tape from diverse surfaces and for the comparison of the lifted fingerprints to the fingerprints before lifting. The powder method was used to visualize fingerprints on the nonporous surface such as PVC, aluminum, glass, and plywood. We compared the feature points of the fingerprints using the Automated Fingerprint Identification System (AFIS). The relationship between damaged fingerprints and surfaces lifted from were evaluated. The fingerprints were stored at room temperature for 1 hour and 7 days. As a result, the fingerprints from all four surfaces showed higher feature points after tape transfer, but the amount of tape transfer from plywood and PVC was remarkably reduced over time. It was also found that the temporal variables were not significantly affected in the surface of glass and aluminum. We suggest that the use of different types of lifting tape based on the surface type after the evaluation of lifting effectiveness from various surfaces.



[1] B. Wilshire, Endeavour, 20(1), 12-15(1996).

PT-130 [법과학]

Determination of β-hydroxybutyric acid in postmortem muscle samples by ultra-high performance liquid chromatography-tandem mass spectrometry

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Beta-hydroxybutyric acid (BHB) is one of the ketone body, and the high concentration of BHB in blood can lead to a sudden unexpected death related with diabetic ketoacidosis, alcoholic ketoacidosis. In forensic cases, the BHB analysis was often performed with postmortem blood samples to investigate the cause of death, and many studies have shown that an elevation of blood ketones has a good correlation with ketoacidosis death.However, an investigation of the levels of BHB in postmortem tissue samples has notbeen investigated well, even though tissue samples (liver, kidney, brain, lung, and spleen)may be the only specimens available in decomposed cases. Therefore, in this study, the analytical method for the quantification of BHB in postmortem muscle samples was developed with ultra-high performance liquid chromatography-tandem mass spectrometry (UHPLC-MS/MS). The muscle samples were pulverized with liquid nitrogen and $^{13}C_4$-BHB was used for an internal standard. Chromatographic separation of BHB and isobaric interferences (alpha-hydroxy butyric acid and gamma-hydroxybutyric acid) was performed with reverse phase column (Waters Acquity HSS T3 2.1 x 100 mm, 1.8 μm). A comparison of the extraction solvents was evaluated with acetonitrile, hexane, ethyl acetate and methyltert-butyl ether and the quantification was performed with SIM mode (57, 59, 85, 103,107 m/z) The proper extraction solvent for a muscle samples was determined by recoverytest.

PT-131 ［법과학］

Quantitative analysis of dyed fiber using raman microspectroscopy in forensic science

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Single fibers are very often encountered in crime scenes and play a very important role in forensic science as trace evidence. Identification and comparison of the specific features for the single fibers will lead to a higher evidential value, which is certainly an advantage in forensic science. In terms of that, color is a particularly important feature of a single fiber. Until now, mainly microscope and IR spectroscopy has been used to determine identification and comparison of the single fibers

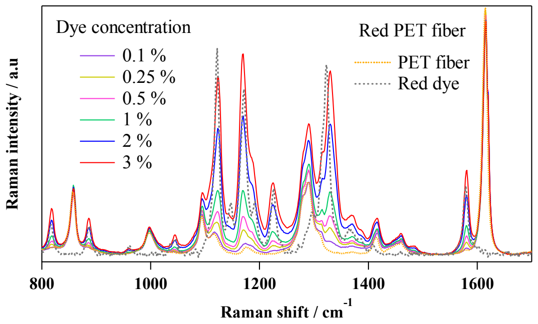
However, the similar colored single fibers are difficult to distinguish by microscopic analysis. Also, IR spectra only showed composition of the fiber, thus limited to provide the distinct information for the similar colored fibers which are the same types of fibers.

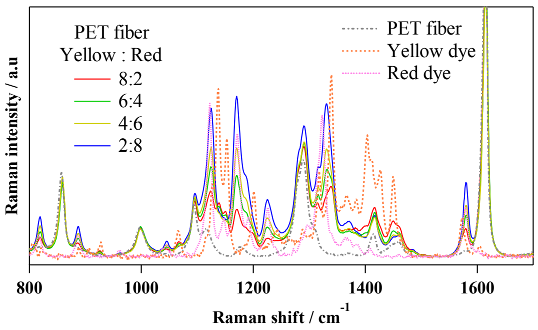
Raman microspectroscopy is one of the powerful technique for analysis of dyed fibers because raman spectrum provides a detailed dye spectrum as well as fiber composition spectrum.

In this study, we showed the measurement results that dyed red and yellow polyester single fiber by using raman microspectroscopy. We performed quantitative analysis of the signal intensity according to dye concentration (0.1~3%). Furthermore, we performed raman measurement of dyed fibers with mixed two dyes at a constant rate.

Our results can be expected to the distinction between similar fibers due to the difference in the content of small amount of dye by quantitative analysis.

Therefore, Raman microspectroscopy shows great potential for identifying and comparison of similar colored fiber evidences.





PT-132 [법과학]

New identification method of stamping ink using DNA

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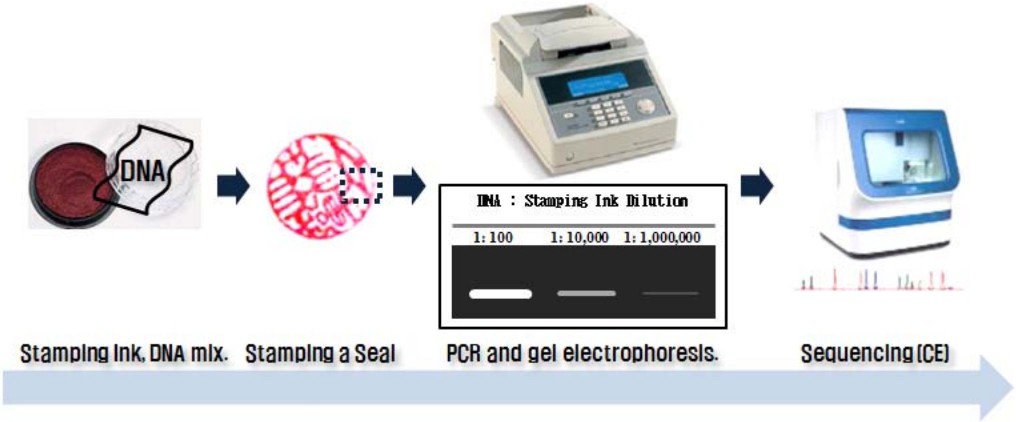
Forgery crimes such as documents, seal and marketable securities are serious that can cost of damage from several million to billion dollars, and used the seal occur with an average rate of 5% [1]. The identification techniques that choose truth of falsehood of the seal is typical of superimpose test, genometric method and syscrisis. However, the existing method has a complicated inspection step, and various error are caused by seal stamp conditions, so there is a limit to accurate identification [2]. Thus, in this study, we devised to identify choose truth or falsehood by using dna as a new method of verifying the authenticity of the stamping ink. The mixture of dna and stamping ink in the ratio of 1:100, 1:1,000, 1:10,000, 1:100,000 and 1:1,000,000 stored at room temperature for 3 months. The supernatant mixed with distilled water was re-amplified as a template.The size of the amplified product was observed by electrophoresis, and the DNAwas stably amplified up to the ratio of 1:10,000. This study suggests that DNA can be appliedto the authenticity test of the seal, which will contribute to the improvement of the reliability of the evidence as well as the objective and accurate results.



[1] J.I. Kim, S.H. Cho, Y.H. Lee, *The Journal of Social Science* 22 (2015) 93-116.
[2] H. Lang, C. Xie, X. Qi, H. Ling, *INFO* 15 (2012) 3695.

PT-133 [법과학]

Case report on the scientific analysis of forged artwork

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The authentication of artwork in the Republic of Korea had depended on Morellian analysis due to their appraised values and limitations in volume. Lately, economic change, such as increase of income and fall of interest rate etc, lead to an increased interest in art which in turn raised not only volume and price of such pieces but also the distribution of forgeries. Unlike other analysis areas, the analysis of artwork faces difficulties in establishing standard analysis methods due to the artistic nature of the subject. Furthermore, forming a social consensus is even more challenging while the results of the conventional analysis can have great social ramifications. It is therefore crucial to compensate Morellian analysis of art specialists with scientific analysis of the utensils and all other materials that were used to create the questioned piece of artwork.

As recently reported in the media, a tremendous rise in market value of the artworks by painter Ufan Lee, lead to an increased number of forgeries, and several questioned pieces were analyzed for authentication. Ufan Lee's representative monotone art paintings 'From Spot' and 'From Line' were created mainly in the late 1970s and early 1980s. Comparative analysis between the authentic pieces from the museum and the questioned pieces was performed since simple elemental analysis was not sufficient for forensic authentication.

Major components of the paint that Ufan Lee has used in his work were Al, Si, Cr Co, Pb, and Zn, but the pieces in question were painted with paint which major components could be categorized into three groups, i.e. Mg, Al, and Si as group 1, Al, Si, Cr, Co, and Pb as group 2, and Al, Si, Cr, Co, Pb, and Zn as group 3. The contents of each element were also different. The adhesive that was used for the paintings was known to be glue for Ufan Lee's work, unlike the one used in the questioned pieces where vinyl acetates and acrylates were detected. Traces of artificial aging were also detected on the back of the canvasses. The backside was painted with a yellow substance which had traces of acrylates, therefore leading to the conclusion that acrylic colors were used in the aging process.

In conclusion, the questioned pieces were different from the artwork of Ufan Lee, in terms of the elemental constitution and their content, the contents of the adhesive and the traces of artificial aging on the backside of the canvass.

PT-134 [법과학]

Differentiation of printing paper using stable isotope ratio mass spectrometry

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There have been an increased number of intelligent crimes related to document forgery and counterfeit money using printing papers. Printing paper are produced in many countries, especially in Asia and Europe, and provided to various countries in the world. During the manufacturing process of printing papers, fluorescent whitening agents and various additives are added allowing diverse chemical composition. However, the differentiation of printing paper is still challenging due to the similar manufacturing process between brands and countries. Isotope ratio analysis is a useful analytical technique, which can provide the discrimination capability for the determination of source of origin as well as differentiation of printing paper with the characteristic stable isotope ratios targeting raw materials used for the manufacturing papers.

In this study, the stable isotope ratios of hydrogen(δD), oxygen(δ^{18}O) and carbon(δ^{13}C) were measured for printing papers to investigate the difference between domestic and international paper products as well as regular and recycled paper products. A total of 34 printing papers (A4-size) purchased from the market were produced from different countries including South Korea (n=5), China (n=12), Indonesia (n=7), Brazil (n=3), Thailand (n=5), Germany (n=1) and Austria (n=1). In order to determine the homogeneity of each product, multiple pages of a paper sample from one realm were analyzed. The stable isotope analysis was performed by elemental analysis-isotope ratio mass spectrometry (EA-IRMS, Thermo fisher, Delta V plus) after 100 to 200㎍ of each sample were encapsulated with pressed tin and silver capsules. The obtained isotope ratios of paper samples were then corrected using standard reference materials, CH_3(Cellulose, δ^{13}C: -24.72 ± 0.041‰) and USGS42(Tibetan hair, δD: -78.50 ± 2.30‰, δ^{18}O: 8.56 ± 0.10‰). Linear discriminant analysis (LDA) was performed to determine the differentiation capability of isotope analysis for printing paper. The results showed 96.55% (Wilks' Lambda = .019, $p<0.001$). Based on the results, it is assumed that the stable isotope ratios of printing papers may have influenced by local water and growing environment of raw materials (timbers and pulps). It is expected that the application of IRMS will be a useful forensic approach to differentiate printing papers between various brands and manufacturing origins.

PT-135 [법과학]

An interrelation of blood alcohol concentration with breath alcohol concentration from a field test in Republic of Korea drinking drivers

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Alcohol concentration in blood, which can easily be determined by the administration of a breathalyzer test, must be below 0.05 % in Republic of Korea for a person to operate a vehicle safely. However, since different bodies by alcohol dosages process alcohol at different rates, they show different percentages of alcohol concentration in the breath and blood for the same amount of alcohol consumed. Therefore, the ratio of blood alcohol concentration (BAC) to breath alcohol concentration (BrAC) was determined for 346 individuals apprehended for driving under the influence (DUI) of alcohol in Republic of Korea. The BAC was determined by headspace gas chromatography (HSGC, Agilent 7890B) and BrAC was measured with breathalyzer (SD-400). Each analysis instrument were approved, calibrated, and standardized. Figure 1 shows the corresponding relative frequency of blood-breath ratio (BBR) with mean and standard deviation of 2,696 ± 323. Note that 95 % of all BBR values were more than 2,100:1. These observation assumed that the BBR of alcohol ranged from about 2,300 to 3000 (i.e., approximately 80 %) without making any correction for the metabolism of alcohol. In conclusion, these data in spring-season indicated that the BBR in Republic of Korea was averagely higher than the ratio of the respective legal limits (2100: 1).

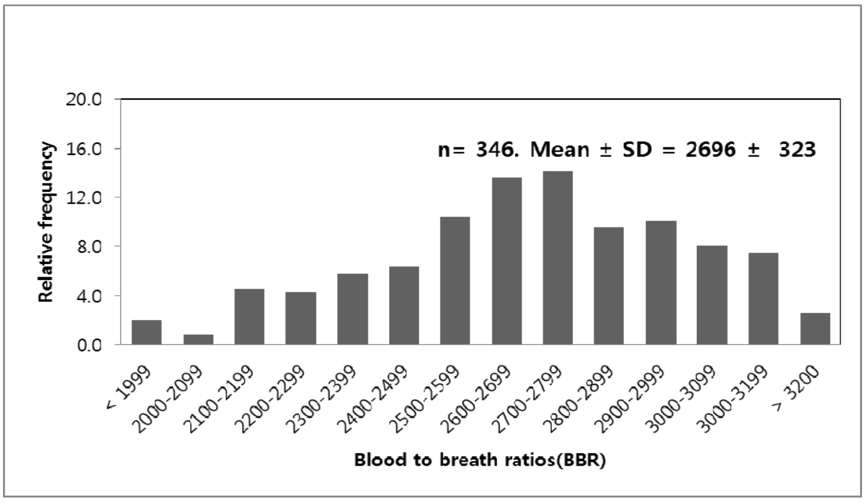

Figure 1. A relative frequency distribution of blood-breath ratios (BBR) of alcohol in Republic of Korea drinking drivers: Effect in spring-season

PT-136 [법과학]

Evaluation study of three commercial STR kits to establish stochastic threshold

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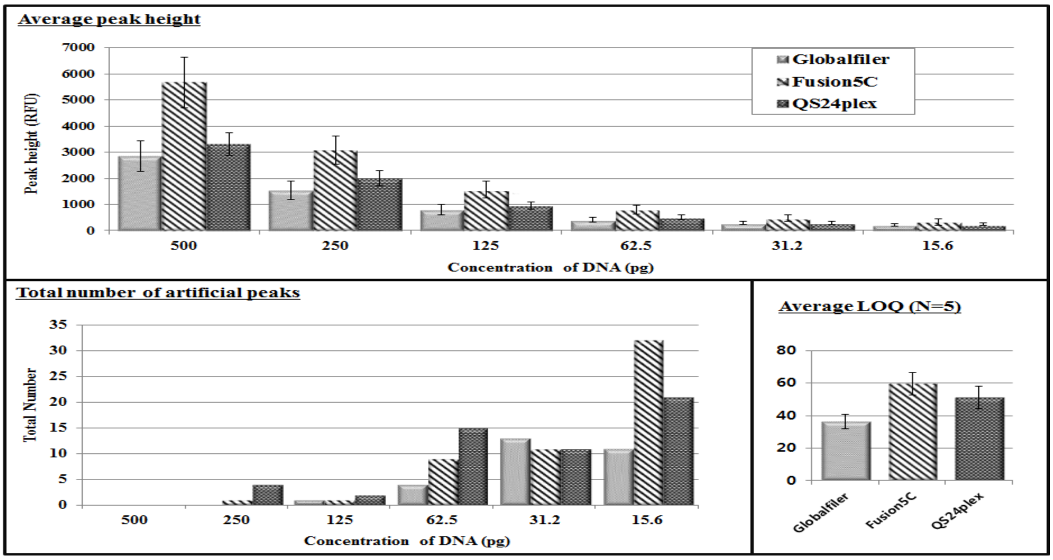
STR (Short Tandem Repeats) is currently considered the gold standard in forensic genetics. As CODIS (Combined DNA Index System) Core loci were expanded from 13 to 20, new commercial STR kits including the expanded loci have been developed and released [1]. GlobalFiler kit of Thermo Fisher Scientific, PowerPlex® Fusion kit of Promega and Investigator 24plex QS kit of Qiagen are representative kits. To facilitate the forensic application of new STR kits, we performed evaluation study of the kits using three control DNA samples (2800M, 9947 and 9948). Two-fold serial dilutions of the DNA were made (500pg, 250pg, 125pg, 62.5pg, 31.25pg and 15.625pg) and all the analyses were carried out in triplicate. Average peak height, the number of drop-out and artificial peaks, and balance of peaks within the locus were calculated. In addition, five blank samples of each kit were used to estimate the LOQ(Limit of Quantitation). The analyzed results were compared between the kits, and GlobalFiler kit was observed with the lowest noise, and PowerPlex® Fusion kit was most sensitive. We suggest that the results of this study can be useful for establishing the stochastic threshold of each kit and it will help reliable data interpretation through understanding the characteristics of the kits.



[1] D.R. Hares, *Forensic Sci Int Genet* 17 (2015) 33-34.

PT-137 [법과학]

Mixture study of globalFiler PCR amplification kit

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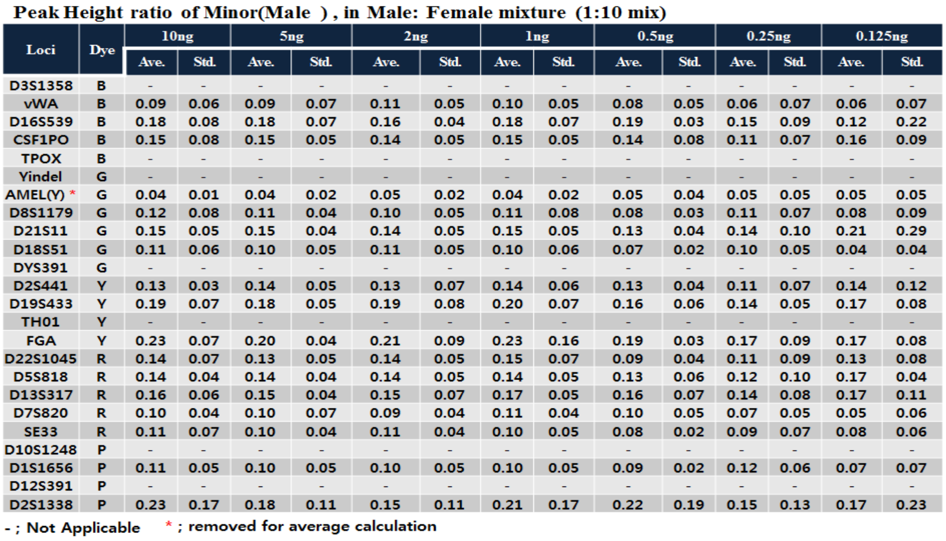
The CODIS (Combined DNA Index System) Core loci were expanded from 13 to 20 to reduce the number of adventitious matches, increase international compatibility and discrimination power [1]. For these reasons, new kits including expanded loci have developed. Representatively, GlobalFiler kit PCR Amplification Kit (GF kit, Thermo Fisher Scientific, Waltham, MA) was released in 2012 and includes the 21 A-STR markers (D3S1358, vWA, D16S539, CSF1PO, TPOX, D8S1179, D21S11, D18S51, D2S441, D19S433,TH01, FGA, D22S1045, D5S818, D13S317, D7S820, SE33, D10S1248, D1S1656, D12S391, D2S1338), one Y-STR marker (DYS391) and one Y Indel. Before the forensic applicationof the kit, inter-laboratory validation is necessary to establish threshold [2]. Besides, professional data interpretation requires understanding of the characteristics of the kit. In this study, we performed mixture study of the GF kit using various concentration of template (10, 5, 1, 1, 0.5, 0.25, and 0.125 ng) with different mixture proportions (1:1,1:2, 1:4, 1:10). Average peak height, peak height ratio, peak area ratio, and the number ofdrop-out were calculated. The estimated values of this study will be useful for establishment of the guidelines for mixture interpretation.



Peak Height ratio of Minor(Male), in Male: Female mixture (1:10 mix)

Loci	Dye	10ng		5ng		2ng		1ng		0.5ng		0.25ng		0.125ng	
		Ave.	Std.	Ave.	Std.	Ave.	Std.	Ave.	Std.	Ave.	Std.	Ave.	Std.	Ave.	Std.
D3S1358	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-
vWA	B	0.09	0.06	0.09	0.07	0.11	0.05	0.10	0.05	0.08	0.05	0.06	0.07	0.06	0.07
D16S539	B	0.18	0.08	0.18	0.07	0.16	0.04	0.18	0.07	0.19	0.03	0.15	0.09	0.12	0.22
CSF1PO	B	0.15	0.08	0.15	0.05	0.14	0.05	0.15	0.05	0.14	0.08	0.11	0.07	0.16	0.09
TPOX	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yindel	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AMEL(Y) *	G	0.04	0.01	0.04	0.02	0.05	0.02	0.04	0.02	0.05	0.04	0.05	0.05	0.05	0.05
D8S1179	G	0.12	0.08	0.11	0.04	0.10	0.05	0.11	0.08	0.08	0.03	0.11	0.07	0.08	0.09
D21S11	G	0.15	0.05	0.15	0.04	0.14	0.05	0.15	0.05	0.13	0.04	0.14	0.10	0.21	0.29
D18S51	G	0.11	0.06	0.10	0.05	0.11	0.05	0.10	0.06	0.07	0.02	0.10	0.05	0.04	0.04
DYS391	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D2S441	Y	0.13	0.03	0.14	0.05	0.13	0.07	0.14	0.06	0.13	0.04	0.11	0.07	0.14	0.12
D19S433	Y	0.19	0.07	0.18	0.05	0.19	0.08	0.20	0.07	0.16	0.06	0.14	0.05	0.17	0.08
TH01	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FGA	Y	0.23	0.07	0.20	0.04	0.21	0.09	0.23	0.16	0.19	0.03	0.17	0.09	0.17	0.08
D22S1045	R	0.14	0.07	0.13	0.05	0.14	0.05	0.15	0.07	0.09	0.04	0.11	0.09	0.13	0.08
D5S818	R	0.14	0.04	0.14	0.04	0.14	0.05	0.14	0.05	0.13	0.06	0.12	0.10	0.17	0.04
D13S317	R	0.16	0.06	0.15	0.04	0.15	0.07	0.17	0.05	0.16	0.07	0.14	0.08	0.17	0.11
D7S820	R	0.10	0.04	0.10	0.07	0.09	0.04	0.11	0.04	0.10	0.05	0.07	0.05	0.05	0.06
SE33	R	0.11	0.07	0.10	0.04	0.11	0.04	0.10	0.05	0.08	0.02	0.09	0.07	0.08	0.06
D10S1248	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D1S1656	P	0.11	0.05	0.10	0.05	0.10	0.05	0.10	0.05	0.09	0.02	0.12	0.06	0.07	0.07
D12S391	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D2S1338	P	0.23	0.17	0.18	0.11	0.15	0.11	0.21	0.17	0.22	0.19	0.15	0.13	0.17	0.23

- ; Not Applicable * ; removed for average calculation

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PT-138 [의약품/화장품]

Stability evaluation of national biological reference standards in Korea

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Biologics are derived from living organisms that have a complex composition and structure, including vaccines, blood products, anti-toxins and recombinant DNA products. Establishment of biological reference standards is essential for quality control and measuring potency or efficiency of biologics as standard materials. National Biological Reference standard(NBRS)s are established by Ministry of Food and Drug Safety(MFDS) with collaborative study, WHO international standards were used as standard materials. National biological reference standards are used to various purposes, such as national lot releases, research, development of biologics in the regulatory facility or laboratory. In order to check whether the potency or contents of the NBRSs are stably maintained, MFDS performs real-time stability test by adjusting period according to the characteristics of each NBRS. The procedure for stability test is carried out in the order of reviewing last year's results, planning, conducting the test, statistical analysis of results and reviewing the results of this year. In this study, we conducted stability test for Blood Coagulation Factor VIII, Blood Coagulation Factor IX, Anti-Hepatitis B Immunoglobulin, Antithrombin Concentrate, Prekallikrein Activator, Haemophilus Influenza type B PRP using appropriate analytical instruments according to the stability test method of each NBRS. As a result, the real-time stability test results for 6 NBRSs were stably maintained within the control limit of each item. We will conduct statistical analysis such as trend analysis to maintain stability by year using all stability test results after the establishment of NBRS including this year's. The results of this study will be used as a basis for the preparing NBRS management plan and contribute to the supply of high quality domestic biologics.

[**] Both authors contributed equally

Product Name	Results	Control limit	
		Reference	Min-Max
Blood Coagulation Factor VIII	8.50±0.28 IU/vial	80%<Assigned potency<120%	9.68 – 14.30
Anti-Hepatitis B Immunoglobulin	125.20±4.36 IU/vial		79.32 – 111.58
Blood Coagulation Factor IX	12.84±0.21 IU/vial	Assigned potency±3SD	7.12 – 10.68
Antithrombin Concentrate	55.50±2.20 IU/vial		45.20 – 58.64
Prekallikrein Activator	65.81±0.78 IU/vial		55.86 – 67.40
Haemophilus Influenza type B PRP	1.21±0.10 mg/vial		1.14 – 1.27

PT-139 [의약품/화장품]

Determination of 21 tar colors in lipsticks by liquid chromatography/tandem mass spectrometry

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The purpose of this study was to develop a method for rapid and efficient analysis of various tar colors in cosmetics. In this regard, we have established and optimised the simultaneous analysis of 21 tar colors using liquid chromatography-electrospray ionization-mass spectrometry/mass spectrometry (LC-ESI-MS/MS). The tar colors in lipsticks were extracted using 20% methanol and chloroform, and purified using solid-phase extraction cartridges method. The method was validated for specificity, linearity, limit of detection (LOD), limit of quantification (LOQ) and recovery. The linear correlation coefficients were good (>0.99), the limits of detection and quantitation of the method ranged from 0.00006 to 0.50 μg/g and from 0.00018 to 1.50 μg/g, respectively. The recovery for this LC-MS/MS procedure was 80.2–117.5%, with an RSD less than 10% (*n*=3).

PT-140 [의약품/화장품]

Identification of a new tadalafil analogue in commercial dietary supplements: isopropylnortadalafil

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A new tadalafil analogue was found in a commercial dietary supplement for enhancing sexual performance. The compound was detected by a high-performance liquid chromatography-diode array detector (HPLC-DAD). The analogue was isolated using semi-preparative HPLC, and its accurate mass was established by two LC-high-resolution-mass spectrometers (LC-HRMS). The structure was determined by nuclear magnetic resonance (NMR) spectroscopy. The accurate mass of the compound corresponded to a molecular formula of $C_{24}H_{23}N_3O_4$. The compound was identified as a structural analogue of tadalafil in which the N-methyl group of tadalafil was replaced with an N-isopropyl group. We have named the new analogue isopropylnortadalafil and it is first reported herein.

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PT-141 [의약품/화장품]

Simultaneous analysis for determination of sedative-hypnotics and sleep inducers in adulterated products by quadrupole-orbitrap-MS and UHPLC-MS/MS

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In this study, we developed and validated a method for determining synthetic sedative-hypnotics and sleep inducers including barbital, benzodiazepam, zolpidem, and H_1-antihistamines in adulterated products using a quadruple-Orbitrap mass spectrometer (Q-Orbitrap-MS) and ultra-high performance liquid chromatography-tandem mass spectrometry (UHPLC-MS/MS). In Q-Orbitrap-MS analysis, target compounds were confirmed using a combination of retention time, mass tolerance, mass accuracy, and fragment ions. For quantification, several validation parameters were employed using UHPLC-MS/MS. The LODs and LOQs ranged from 0.05 to 53 ng/mL and 0.17 to 177 ng/mL, respectively. The linearity, based on the correlation coefficient, R^2, was more than 0.995. The intra- and inter-assay accuracies were 86-110% and 84-111%, respectively. Their precision values were evaluated as within 4.0% (intra-day) and 10.7% (inter-day). Mean recoveries of target compounds in adulterated products ranged from 85 to 116%. The relative standard deviation of stability was less than 10.7% at 4°C for 48 h. The 144 adulterated products, obtained for 3 years (2014-2016) from online and in-person vendors, were tested using established methods. About two of them were adulterated with phenobarbital.

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PT-142 [의약품/화장품]

Metabolic profile determination of 24N-NBOMe by human liver microsomes using LC-TOF-MS

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2-(2,5-Dimethoxy-4-nitrophenyl)-N-(2-methoxybenzyl)ethanamine(25N-NBOMe, 2C-N-NBOMe, NBOMe-2C-N) is novel synthetic psychedelic substance of the phenethylamine chemical class. 25N-NBOMe has a notably shorter duration than the rest of the 25x-NBOMe series with a total duration of 6 hours and a peak duration of 2 hours. A few metabolism studies were conducted for 25I-NBOMe, 25B-NBOMe, and 25C-NBOMe, etc, whereas 25N-NBOMe metabolism was not researched.

In this study, the in vitro metabolism of 25N-NBOMe has been investigated with human liver microsomes (HLM), and the reaction mixture was analyzed using liquid chromatography-quadrupole time-of-flight mass spectrometry (LC-Q/TOF-MS)

Formation of 14 metabolites (M1-M14) was yielded with incubating 25N-NBOMe in HLM in the presence of NADPH. The metabolites were structurally characterized on the basis of accurate mass analysis and MS/MS fragmentation patterns. The biotransformations included hydroxylation, O-demethylation, N-dealkylation, nitro reduction, dehydrogenation, carbonylation, and combinations thereof. Hydroxyl metabolite was the most abundant compound after the phase I process.

The results provide evidence for in vivo 25N-NBOMe metabolism and its metabolites can be applied to the analytical method for monitoring the 25N-NBOMe abuse in biological samples.

Keyword: 25N-NBOMe, Metabolism, HLM, LC-Q-TOF/MS

PT-143 [의약품/화장품]

Simultaneous determination of 19 new psycoactive substances in human plasma for quantitative analysis with LC-MS/MS

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A fast and sensitive method based on solid phase extraction and high performance reversed-phase liquid chromatography tandem mass spectrometry (LC-MS/MS) for the simultaneous determination of Mexedrone, Allylescaline, BOD, Synthacaine, Methallylescaline, 2-DPMP, 25H-NBOMe, 25C-NBOH, 25N-NBOMe, 2-MeO-diphenidine, 25C-NBF, 25B-NBF, 25I-NBOH, 25I-NBF, 25B-NBOMe, Flubromazepam, 25E-NBOMe, ORG27569, and W-18 in whole blood was developed and validated.

Following solid phase extraction, the analytes were separated on poroshell 120 EC(100 mm x 2.1 mm, 2.7 um, Agilent) under gradient elution using a mobile phase containing of acetonitrile and 0.1% formic acid in water at a flow rate of 0.3 mL/min and analyzed by a triple quadrupole mass spectrometer in the multiple reaction monitoring (MRM) mode. The calibration range was 1–100ng/ml with a correlation coefficient greater than 0.99.

Recovery varied from 54.03 to 118.52% and matrix effects ranged from 8.72 to 116.64%. The intra- and inter-batch precisions were from 0.85 to 15.90% and the accuracy was from 84.41 to 110.97%. The present method was proved to be reliable and robust for drug screening in New Psycoactive Substances (NPSs) analysis.

Keywords: simultaneous determination, LC-MS/MS, solid phase extraction, multiple reaction monitoring (MRM), New Psycoactive Substances (NPSs)

PT-144 [의약품/화장품]

Improvement of enantiomeric purity method for clopidogrel bisulfate in korean pharmacopoeia

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An enantiomer is one of two stereoisomers that mirror images of each other that can not be superimposed. Enantiomers have identical chemical and physical properties with the exception that they rotate plane-polarized light by equal amount in opposite directions. It is also called optical isomers. Enantiomers often have different pharmaceutical effects or toxicity with other enantiomer. The general method for quality test of enantiomer drugs are Specific rotation and Enantiomeric purity test. Enantiomeric purity test using High Performance Liquid Chromatography have high specificity and efficacy, Recently international trend is to develop a more precise analytical method in the official compendium.

To improve the chiral analysis method in Korean pharmacopoeia, we reviewed major offical compendiums and validated Enantiomeric purity test method for Clopidogrel Bisulfate by specificity, linearity, accuracy and precision. This results of method validation showed high specificity. The correlation coefficients (R2) for the calibration curves of linearity were 0.9999 and precision were relative standard deviation (RSD) 0.62%. Quantification limits were determined to be 0.40 μg/ml, respectively by confirming signal to noise ratio of Chromatogram. Also, active pharmaceutical ingredient (API) samples of clopidogrel bisulfate were analyzed via validated method and peaks of contents of both RS and sample were showed at same retention time.

As a result, developed analytical methods will be used for revising the monograph in Korean Pharmacopoeia and we hope that the new method may improve quality control efficiency of pharmaceutical products.

PT-145 [의약품/화장품]

Analytical method development of enantiomeric purity for tamsulosine hydrochloride in korean pharmacopoeia

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With some drugs, one of the enantiomers is mostly accountable for a given pharmacological activity. Also the other enantiomer may be less active, toxic and inactive, or may give rise to an entirely different pharmacological response. Therefore, strict quality control is necessary.

In this study, we have developed the analytical method of enantiomeric purity for tamsulosin hydrochloride whose ratio of active substances are managed in United States Pharmacopoeia (USP) but not set in Korean Pharmacopoeia (KP). We developed HPLC test methods which measures the active substance ratio of Tamsulosine Hydrochloride.

To analyze the enantiomeric impurity of tamsulosine hydrochloride, we used following experimental conditions; column(L51(4.6 mm x 250 cm x 5 μm)), flow rate(0.5 mL/min), detector (UV, 210 nm) and the mobile phase solution(hexane : dehydrated alcohol : methanol : diethylamine, 650 : 200 : 150 : 1). The correlation coefficients (R^2) for the calibration curves of linearity were 0.9999 and precision were relative standard deviation (RSD) 0.82%. Quantification limits were determined to be 0.80 μg/ml, respectively by confirming signal to noise ratio of Chromatogram.

Validation was conducted according to the 「Manual for Guideline for Validation of Analytical procedures_of MFDS」.

Improved method to check enantiomeric purity ratio is expected to contribute to the quality management of the concerning substances.

PT-146 [의약품/화장품]

Thermogravimetry(TG), as an alternative test method for volatile impurity test of reference standard

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For establishment of reference standards, Mass balance method has been used in establishing USP and/or EP references as well as MFDS reference standards. The loss on drying method, one of the factor in method balance equation, has been applied traditionally to check the quantities of volatile impurities in most of Pharmacopeias. But this method consume too much samples. So thermogravimetry(TG) is being considered as an alternative testing method to reduce the quantities of samples.

We compared the results of TG and loss on drying method with two samples. The applied quantity of samples was 10 mg to 40 mg in TG and 1 g of samples were used in the loss on drying method. We found out that TG results are dependent on the amount of test samples. So the test result of TG did not always reflect the test result of loss on drying method. For that reason, investigation of the nature of each substance is needed before substitute TG for traditional loss on drying method.h sample, a thorough investigation of the nature of the substance should be preceded.

PT-147 [의약품/화장품]

Development of the analytical method of ethanol with GC/FID using capillary column for the purity test of dexamethasone phosphate disodium in korean pharmacopoeia

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Dexamethasone phosphate disodium is a sodium phosphate salt form of dexamethasone, a synthetic corticosteroid with potent anti-inflammatory properties. The ethanol test of purity in dexamethasone phosphate disodium is a gas chromatographic method using packed column in Korean Pharmacopoeia. For the usability and reliability with performance providing excellent confidence and usability, a gas chromatographic method using capillary column is herein introduced for the determination of ethanol in dexamethasone phosphate disodium. The analytical method of ethanol in dexamethasone phosphate disodium was developed under simple dissolving 0.2 g of dexamethasone phosphate disodium sample in 10 mL of 1-PrOH internal standard at 1,004 ug/mL step. The operating conditions are 14 min on column (DB-624, 0.53 mm i.d. × 30 m, 3 μm), using nitrogen gas adjusting split ratio with 5 : 1 and constant column flow with 5 mL/min The results on specificity, linearity, resolution, reproducibility and limit of detection were validated. Calibration curve was linear with regression coefficient greater than 0.999 over the concentration ranges 25-2,000 μg/mL of ethanol. Six consecutive runs were analyzed for their precision regarding the area of ethanol peak at 810 ug/mL of sample solution and 1,500 ug/mL of standard solution. The relative standard deviations (RSDs) of the area of ethanol peak did not exceed 1% and absolute mean recoveries of the ethanol ranged from 99.0 to 99.6%. The limit of detection and limit of quantitation of ethanol in this method were 5.3 ug/mL and 16.3 ug/mL, respectively. This method could be successfully applied to real samples and it seems to be a suitable tool for routine monitoring and quality control of the ethanol check in dexamethasone phosphate disodium. As a result, the developed analytical method using capillary column of ethanol in dexamethasone phosphate disodium will be used for revising the monograph of dexamethasone phosphate disodium in Korean Pharmacopoeia and contribute to quality control of dexamethasone phosphate disodium by improving performance, speed, accuracy and reliability and removing the time consuming problem of packed column.

PT-148 [의약품/화장품]

Development and validation of high-performance liquid chromatographic method for common assay of cefbuperazone sodium for injection and cefbuperazone sodium in Korean Pharmacopoeia

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Medicinal product manufactures conduct quality control of active pharmaceutical ingredient (API) and final product simultaneously according to the Korean Pharmacopoeia (KP). However, there are inconveniences in the current KP because in some cases, the HPLC assay of (API) and final product requires the different operating conditions such as column and mobile phase.

In this study, we intended to develop a test method that is commonly applicable to the API and final product listed in KP in order to enhance the convenience of the manufacturers.

When we find KP monographs, which have different operating conditions, between API and final product we compared KP test method with that of the foreign pharmacopoeia. Considering the production records, we selected 'cefbuperazone sodium for injection' and 'cefbuperazone sodium' as a final target to study.

We have developed the common assay of 'cefbuperazone sodium for injection' referring to the API test method of current KP and Japanese Pharmacopoia. High-performance liquid chromatography (HPLC) method was achieved using a C18 column (150 x 4.6 mm, 5 μm) and mobile phase consisting of 2.0 g of tetra-n-propylammonium bromide in 1000 mL of mixture of water, acetonitrile and acetic acid-sodium acetate buffer solution (pH 5.0) (83:13:4). Analyses were performed at a detection wavelength of 254 nm. The method was shown to be selective, linear, accurate, and precise in Method Validation (MV). In addition, inter-laboratory repeatabiltity and reproducibility using marketed products were confirmed.

It is expected that the common applicable assay of API and final products of cefbuperazone sodium will increase the efficiency of drug quality control.

PT-149 [의약품/화장품]

LC-MS based profiling and inhibits melanogenesis activation from *Rhizoma Arisaematis*

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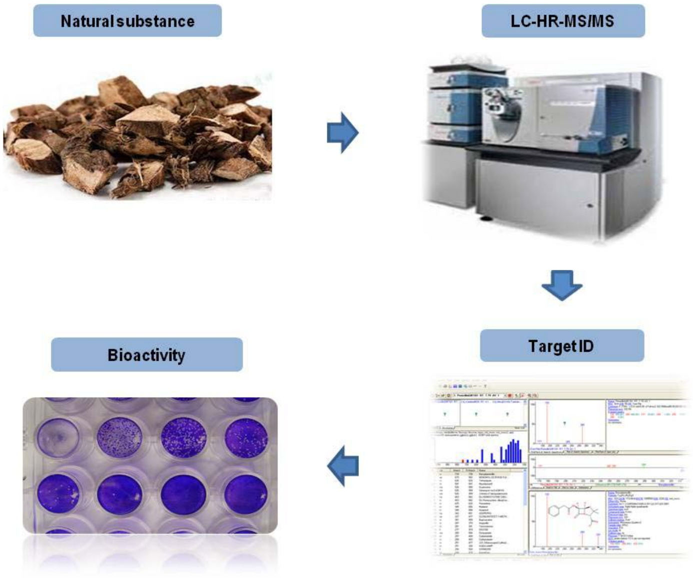
Rhizoma Arisaematis (RA, the rhizome of Pinellia pedatisecta Schott) is a traditional Chinese medicine commonly used in the treatment of convulsions, inflammation, and cancer. Despite the fact that it has been used for more than 2000 years, the pharmacological and toxic effects of traditionally processed products of RA are still unclear [1, 2]. In this study, we extract of RA for inhibition of autophagy reduced the anti-melanogenic activity of RA in ɑ-MSH treated B16F1 cells and confirmed the anti-pigmentation effect of RA in human skin model.

In order to identify the active compounds in EA extract, we performed metabolite profiling using by high-resolution mass spectrometry(HR-MS) and tandem mass spectrometry (MS/MS) analysis. The analysis was followed by in-house MS/MS spectral database search to correlate both high-resolution mass spectrum and formula prediction of each component in EA extract with those of known compounds in natural-product databases available online. The profiling results were confirmed by comparing the MS and MS/MS spectral characteristics of the commercial standard compounds.



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PT-150 [의약품/화장품]

Application of AMS for PK and brain distribution of C-14 taurine related to dementia

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Taurine exists in high concentrations in the body including central nervous system. It plays many biological roles such as CNS development, temperature control, stabilization of protein folding, osmoregulation etc. Recently, when taurine was introduced into transgenic mouse resulting in Alzheimer disease, cognitive ability of mouse could be enhanced compared with non-treating mouse. Studies have shown that taurine is effective in Alzheimer's dementia. [1] On the other hand, in order to accurately understand the effect of taurine on dementia, it is necessary to check the PK parameters and confirm the distribution in the brain. LC-tandem mass spectrometry (LC-MSMS) generally used in identifying concentration of substance couldn’t be appropriate to confirm the concentration of taurine in plasma or brain, because it is hard to distinguish taurine externally introduced from endogenous taurine already existed with high concentration in body,

In this study, C-14 taurine was orally administered to mouse and the concentration of C-14 taurine in plasma and brain was measured through highly sensitive Accelerator Mass Spectrometry (AMS). Concentration of C-14 taurine could be estimated without any interferences of endogenous taurine. The distribution of C-14 taurine in the brain at the Tmax, obviously showed that C-14 taurine externally introduced was presented in the region of the hippocampus, which is known to be closely related to dementia. This study clearly show that method used in current study could be very useful to confirm ADME parameters of externally injected substance without interferences of endogenous substances which is already presented at high concentrations in the body.

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PT-151 [의약품/화장품]

The study on distribution of ^{14}C thymidine labeled mesenchymal stem cells in vivo using accelerator mass spectrometry

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Identification of migration and distribution of stem cells is essential for the development of stem cell based therapeutic strategies. We were developed a new method for stem cell distribution evaluation using ^{14}C tracer and accelerator mass spectrometry (AMS). BALB/c nude mice were intravenously injected with 3×10^6 mesenchymal stem cells (MSCs) labeled with ^{14}C thymidine which incorporates into DNA strands during cell replication. Each organ (brain, heart, lung, liver, stomach, kidney, spleen small intestine and large intestine) at 3 and 7 days was removed after injected. The dried organs were homogenized using liquid nitrogen and mortar, and then chemically prepared for AMS assessment of total radio activity (TRA). ^{14}C labeled mesenchymal stem cells were detected mainly in the small intestine, lung, large intestine and spleen of the mice. We have found that using ^{14}C labeled mesenchymal stem cells and AMS we are able to quantify very small amounts (~10 cells) of stem cells in organs. This method is more sensitive for tracing stem cells than other methods currently available.

PT-152 [의약품/화장품]

Analysis of 13β-Ethyl-3-methoxy-gona-2,5(10)-diene-17-one and its metabolites after oral administration by LC/MS and GC/MS

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AASs are widely used to improve athletical performance and/or enhance appearance. However, they have been banned by the World Anti-Doping Agency (WADA) for the side effects steroids possess, and the possibilities of being abused in sports games. Despite the ban, AASs are easily purchasable and new steroids, known as designer steroids, are also being developed. Therefore, identification of the steroids' metabolites and their metabolic process is important in the aspect of determining whether they are administered.

13β-Ethyl-3-methoxy-gona-2,5(10)-diene-17-one, also known as Methoxygonadiene is an AAS synthesized from progestin. It is a steroid easily obtainable, but has never been studied in the past. The purpose of this study was to identify the metabolites of 13β-Ethyl-3-methoxy-gona-2,5(10)-diene-17-one from urine samples obtained from volunteers after being orally administered. The urine samples were collected for approximately 48 hours post-dosed. Urine samples were first purified, hydrolyzed, then extracted with organic solvent. LC/MS and GC/MS were used for analysis. For GC/MS, TMS derivatization was additionally processed. The overall optimization of the process was also studied by examining the influence of extraction pH, solvent and derivatization time and temperature.

Study on effect of particle size and content of mica on sun protection factor (SPF) using gravitational field-flow fractionation (GrFFF) and dynamic light scattering (DLS)

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The light from the sun is made up of lights of various wavelengths including infrared (IR), visible (VIS), ultraviolet (UV), X-ray and γ-ray. Although the amount of UV is not high at about 6%, the human body, especially the human skin is most sensitive to UV. The UV is further divided into three regions depending upon the wavelength. They are UV-A (320 to 400 nm), UV-B (290 to 320 nm) and UV-C (100 to 290 nm). UV-C is almost completely absorbed by stratospheric ozone and does not reach the surface of ground and thus the human skin. Unlike UV-C, the UV-A and UV-B are not absorbed by the ozone layer, and cause harmful effects to human such as skin cancer [1]. About 90 ~ 95% of UV reaching the skin are UV-A, which is also called 'life UV'. It is known that UV-A acts as a main cause of photo-aging, such as darkness. Day or night, constant amount of UV-A reaches skin dermis, causing darkening and loss of elasticity of the skin, resulting in wrinkles. It is known that the mica protects the human skin from sunlight by reducing fine lines and pores. The mica is currently used as a coloring agent in sunscreen products. Still there are no reports on the effect of mica on the sun protection factor (SPF) [2]. This study aims to investigate the effect of the particle size and content of mica on SPF. We have prepared sunscreen formulations by mixing TiO_2, OMC, and mica at various ratios, and investigated the effects of the composition of the formulation and the particle size of mica on SPF. The dynamic light scattering (DLS) and gravitational flow field-flow fractionation (GrFFF) were used to analyze the particle size of the mica. Experimental results will be presented and discussed.
At the results, the nominal size of mica was 5 μm, but the actual size of mica measured by optical microscopy (OM) was 3 ~ 11 μm. Furthermore, the ratio of TiO_2:OMC was the most effective at 2:1, and the SPF was found to change as the ratio of mica amount.

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PT-154 [의약품/화장품]

Non-targeted metabolic profiling analysis for diagnosis of internet/smartphone addiction disorder

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Smartphone addiction, sometimes called “nomophobia” (fear of being without a mobile phone), is often fueled by an Internet overuse problem or Internet addiction disorder [1]. In a recent study, internet/smartphone addiction is related to various kinds of psychiatric problems such as depression, attention deficit hyperactivity disorder (ADHD), impulse control disorder and low self–esteem, but the precise cause of this is still unknown [2]. In vivo metabolic studies to elucidate the pathogenesis of Internet/smartphone addiction, only a fractional study of single markers such as DHEA and cortisol has been published, and systematic studies on their alteration by metabolic pathway have not been conducted yet to be [3]. Therefore, in order to diagnose and treat Internet/smartphone addiction, research to clarify the mechanism of onset through bio-metabolism analysis is needed. In this study, non-targeted metabolic profiling analysis for diagnosis of internet/smartphone addiction disorder was performed by ultra-performance liquid chromatography-quadrupole time of flight mass spectrometry (UPLC-Q-TOF MS) combined with multivariate statistical analysis. Urine samples were separated using Imtakt Cadenza HS-C_{18} column (2 x 100 mm, 3 μm) and a mobile phase consisting of eluent A (0.1% formic acid and in water) and eluent B (0.1% formic acid in acetonitrile) with a gradient program at a flow rate of 0.4 mL/min and were monitored by Q-TOF MS. Markerlynx™ and SIMCA were used for statistical processing. Metabolic patterns obtained from patients with internet/smartphone addiction disorder were distinguishable from controls. The alteration of metabolism in biological samples may play an important role to understanding probable disorder, and the described methods could be used to evaluate and monitor patients with internet/smartphone addiction.

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PT-155 [의약품/화장품]

Simple and sensitive assay for quantification of oseltamivir phosphate(Tamiflu®) in human plasma using by LC-MS/MS : Application in bioequivalence study

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Oseltamivir phosphate (OP, Tamiflu®) is an ethyl ester prodrug, which is converted in vivo to the active neuraminidase inhibitor oseltamivir carboxylate (OC). It is widely used for treatment/prevention of influenza. The analytes and the internal standards were isolated from plasma samples by protein precipitation and determined by high-performance liquid chromatography (HPLC) with tandem mass spectrometric (MS/MS) detection. The MS/MS analysis was performed using a TQ 4500(AB Sciex, USA) with an ESI interface to the LC. The chromatographic separation was performed on Poroshell 120 EC C_{18} (3.0 × 50 mm, 2.7 um, Agilent) column with isocratic mobile phase. ESI–MS/MS analysis was operated using multiple reaction monitoring (MRM) in positive ion mode. *m/z* 313.2 > 166.1 for Oseltamivir and *m/z* 316.2 > 211.2 for Oseltamivir-d_3 (IS). The method achieved a lower limit of quantitation of 1 ng/mL. A detailed validation of the method was performed as per KFDA guidelines and the standard curves were found to be linear in the range of 1 ~ 300 ng/mL with a mean correlation coefficient >0.998 for drugs. The recovery was 77.36 and 82.43% for Oseltamivir and IS, respectively. In human plasma, Oseltamivir was stable for at least 63 days at -70±5°C and 22 h at ambient temperature. After extraction from plasma, the reconstituted samples of Oseltamivir was stable in an autosampler at 10°C for 46 h. Also, the cited drugs were stable in plasma samples upon subjecting to three freeze thaw cycles. The method is simple, specific, sensitive, precise, accurate and suitable for bioequivalence and pharmacokinetic studies.

PT-156 [의약품/화장품]

Anti-microbial activity of silver fabrics

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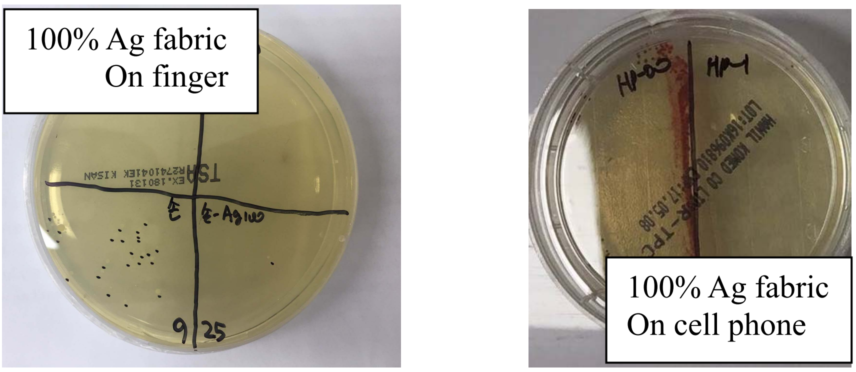
Silver (Ag) is increasingly used in consumer products like functionalized textiles and medical devices owing to its strong anti-microbial activity which is largely assigned to Ag ions released after oxidation of metallic Silver (Ag).

The Anti-microbial activity of silver fabrics (3.5%~100% Ag) has been studied for two microbial: *staphylococcus aurous* ATCC 6528(황색포도상구균) and *klebsiella pneumonia* ATCC4352(폐렴간균) The result are over 99% microbial reduction in wet method (KS K. 0693:2016)

Dry wiping with 50% and 100% silver fabric for 10 seconds appears to significant reduce overlapping bacteria presence on skin and phone surface.



Before & after 10sec wiping

The efficacy of Silver fabrics are safe, chemical-free and dry disinfectants compared to the leading most popular gels, spray and disposable wipes on the market that advertise they kill 99% of germs and viruses.

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PT-157 [의약품/화장품]

HPLC method development for the photo-stability test of diphencyprone (DPCP) and its dispensary medication

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Diphencyprone (DPCP) is a medical material and uses as dispensary medication to treat alopecia areata disease [1, 2]. And DPCP is unstable under light because DPCP is converted to diphenylacetylene (DPA) by photo-decarbonylation at UV or sunlight [3]. To verify the stability of DPCP, it needs an analytical method to determine DPCP and DPA together. Thus, this study aims to develop simultaneous analytical method for DPCP and DPA by HPLC-UV to estimate the stability of DPCP. In order to monitor the influence of light source, DPCP and DPCP dispensary medication were exposed individually up to 2 hours at three different light sources (sunlight, 254 nm and 365 nm). In results, the developed HPLC-UV conditions based on a C18 column (250 x 4.5 mm, 5 μm) were set up following; column temperature of 40 ºC, detection wavelength of UV 254 nm, flow rate of 1 mL/min and injection volume of 5 μL. Mobile phase consisted of 0.01 M aqueous phosphoric acid (A) and acetonitrile (B) was eluted gradient condition for 35 min. The developed method was well validated. Photo-stability of DPCP powder and formulation was different according to three light sources and exposed time. DPCP powder at UV 254 nm wavelength was slowly increased for one hour of exposed time, but it quickly increased after one hour. While, photo-convert ratio at UV 365 nm oppositely showed the photo-degradation pattern of DPCP by UV 254 nm. However, DPCP formulation at both of UV 254 nm and 365 nm showed the similar photo-degradation pattern. Also, both of DPCP powder and formulation at sunlight were showed the similar photo-degradation each other. In conclusion, it is indicated that the photo-stability in DPCP powder and formulation is depending on the light sources and exposed time, and developed simultaneous analytical method for DPCP and DPA is useful for the photo-stability evaluation of DPCP medicine.

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PT-158 [의약품/화장품]

Development of an HPLC-UV method for the quantification of phenolic compounds in *Orostachys japonicus*

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Orostachys japonicus (Korean name: Wasong) is a useful medicinal herb. In Korea, it frequently used for the treatment of cancer, coagulation, metritis and gingivitis [1]. Furthermore, this herb extract is also a functional additive for food or cosmetic products because of its anti-oxidant activity. The study for total phenolic acids and flavonoids content in this herb using UV-Vis spectrophotometer has been reported to figure out the relation with anti-oxidant [2]. However, the HPLC-UV (High performance liquid chromatogram-ultra violet detector) study about phenolic acids and flavonoid simultaneously of this herb has not performed. The quantitative information of phenolic compounds as active compounds is important for quality control of *Orostachys japonicus*. This study aimed to develop a simple HPLC-UV for quantification of gallic acid, epicatechin 3-gallate, quercitrin, afzelin, quercetin and kaempferol in *Orostachys japonicus*. The mobile phase was 0.1 % formic acid in water (A) and 0.1 % formic acid in acetonitrile-methanol (2:1) solution (B). The elution was carried out from 5 % to 60 % B for 65 min. Detector was set up at 261 nm. The retention time of gallic acid, epicatechin 3-gallate, quercitrin, afzelin, quercetin and kaempferol were 8.7, 30.5, 36.5, 40.7, 46.5 and 53.5 min, respectively. The developed method was validated by the linearity, limit of detection (LOD), limit of quantification (LOQ), the intra-/inter-day precision and accuracy. The content of gallic acid, epicatechin 3-gallate, quercitrin, afzelin, quercetin and kaempferol were 0.566, 0.463, 0.964, 0.514, 0.099 and 0.062 mg/g, respectively. As the results, the method was well-validated and suitable for quantification of phenolic compounds in *Orostachys japonicus* quickly and accurately.

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PT-159 [의약품/화장품]

Development of high performance liquid chromatography assay method of tramadol hydrochloride injection

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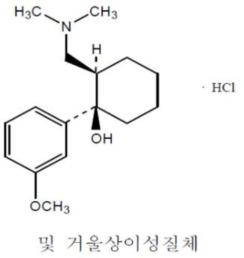
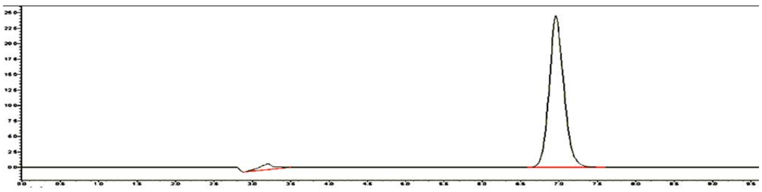
Currently, ultraviolet-visible spectrophotometry and titration methods have been used for the assay tests of Tramadol Hydrochloride injection and raw material in Korean Pharmacopoeia XI (KP XI) [1]. Titration also has been used in British Pharmacopoeia (BP 2013) for the assay test of tramadol hydrochloride [2] and HPLC assay for tramadol hydrochloride ingredient has been used in United States Pharmacopeia (USP 39) [3]. In this study, we developed an alternative HPLC assay method for tramadol hydrochloride injection which is up to date, specific, and same method as tramadol hydrochloride capsules. Method validation of HPLC method was conducted to determine linearity, precision, accuracy, system suitability, robustness. The linearity of the calibration curves in the desired concentration range is good (r^2>0.9999). RSDs of intra-day precision obtained were 0.05~0.08% and inter-day precision obtained were 0.08~0.19%. Accuracy was obtained with recoveries in range of 98.16%and 100.9%. As a result of system suitability, RSD of retention time and the peak area obtained were 0.07% and 0.07% respectively. The values of plate number and asymmetry factor of tramadol hydrochloride obtained were 7075.810 and 1.163 respectively. As intermediate-precision and robustness of the developed assay, it could be expected to become valuable tools for revising the Korean Pharmacopoeia (KP XI).





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PT-160 [의약품/화장품]

An HPLC method for the determination of thioctic acid in raw material and tablets

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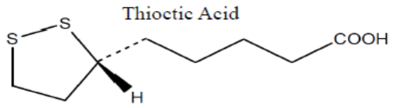
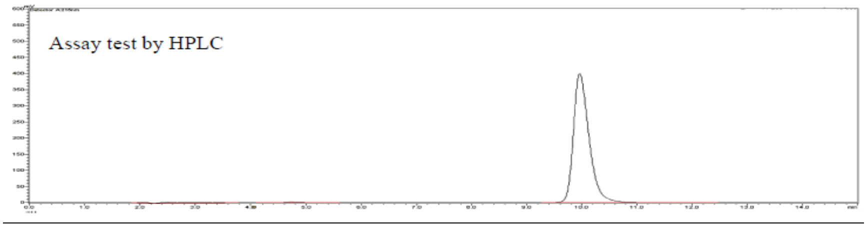
Thioctic acid is a vitamin-like antioxidant which is prepared as tablets and injection [1]. The Korean Pharmacopoeia (KP XI) contains monograph for the quality control of raw thioctic acid using ultra-violet visible spectrophotometry and its formulations using high performance liquid chromatography (HPLC) [2]. In British Pharmacopoeia 2013 (BP2013), another HPLC method is used for the assay test of thioctic acid material [3]. For the international harmonization, we present an HPLC method for quantitation of thioctic acid in both raw material and tablets. Method validation was performed to determine linearity, precision, accuracy, system suitability, and robustness. The linearity of calibration curves in the desired concentration range was high (r^2 = 0.9995), while the RSDs for intra- and inter-day precision were 0.93 ~ 1.26 % and 1.40 ~ 1.76 %, respectively. Accuracies ranged from 98.13-100.00 %. Since the system suitability, intermediate-precision and robustness of the assay were satisfactory, this method will be a valuable addition to the Korean Pharmacopoeia (KP XI).




Raw material


Tablet dosage form



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PT-161 [무기/재료]

Characteristic analysis to the surface of stainless steel coated Au(III)-plated

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The surface treatment technology of metal is a technique of treating a metal surface for improving not only the corrosion resistance and abrasion resistance but also the color and gloss of the metal surface. Especially the electrical conductivity of contact materials can be largely reduced by corrosion, in order to avoid corrosion and abrasion, protective coatings must be used precious metals. Applicable fields are automobile, electric and electronic communication as well as fashion and wearable industry, and it gives high added value and performance improvement effect to materials and products. The copper alloy plate were heated to 600 ℃ under a vacuum of (0.1 ~ 0.8) Pa. And nickel ingot was used as a target[(30~60) cm^3/min] to form (0.15 ~ 0.30) μm nickel coating film by argon gas sputtering. Finally Au electrodeposition was conducted with the solution of (1~3) g/L Au(III) at pH of 0.5~1.0, the temperature of (20~35) ℃ and the current density of (2~6) A/dm^2. It was found that the prepared specimens show excellent surface properties with increased hardness and wear resistance. In addition, it is confirmed that the productivity is improved by shortening the process and the economic effect is saved by reducing the amount of gold used by about 20 %.

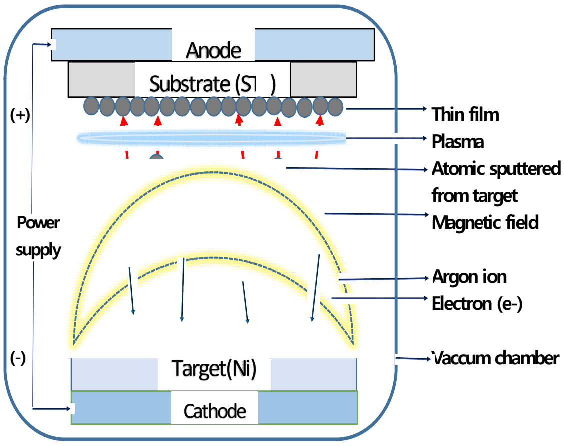

Fig. 1 Nickel sputtering[3]

	Nickel thickness (%)	Corrosion resistance (times)	Durability (times)
Au(III)/Au(II)-plated on stainless steel	0.87	1.8	6
	Abrasion resistance (times)	Usage of Au(%)	
	4	80	

Table 1. Physical property of Au(III)-plated vs. Au(II)

[1] Korea patent No. 10-1589631, The method of gold plating to the metal and nickel alloys.
[2] Jian Song, Liang liang Wang, Andre Zibart, Christian Koch, Corrosion protection of electrically conductive surfaces, Metals 2012, 2, 450-477
[3] Gary E. Mc Guire Semiconductor materials and process technology handbook, Mc Graw Hill Inc., 364-368, 1980

PT-162 [무기/재료]

Significance test of limestone certified reference material

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Limestone is the most common calcium mineral, the main ingredient being calcium carbonate and impurities including silicon dioxide, aluminum oxide, and magnesium oxide. It is the main raw material of cement which is mainly used for construction materials. It is base material of calcium oxide used in steel industries to remove impurities such as phosphorus, silicon and sulfur. As such, limestone is a raw material used in various fields and is used in various industrial fields by itself. The Korean Industrial Standard (KS) describes the chemical composition analysis method of limestone as KS E 3071 (Methods for chemical analysis for limestone) and KS E 3075 (Method for X-ray fluorescence analysis of limestone and dolomite). Therefore, In order to ensure the reliability of the test method, the significance of the test method was confirmed using the Certified Reference Material (CRM). The CRM of limestone was analyzed for major chemical components according to each test method, and each analysis value was compared with the CRM property value, and the significance was confirmed by t-test (two-sided test).

PT-163 [무기/재료]

Study on evaluation of thermal conductivity characteristics of isolation-heat paint

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Energy conservation is becoming a global concern as the temperature of buildings increases in summer and energy consumption becomes serious due to global warming. Accordingly, isolation-heat paint for improving energy efficiency is emerging by applying a hollow sphere in a paint to prevent heat accumulation by obstructing the heat conduction to the substrate, blocking the heat coming from the roof and the outside of the building.

However, despite the increased interest in the thermal conductivity of paints due to the emergence of energy efficiency problems, there is no way proper test method in Korea, so it is necessary to study it.

This study focused on thermal conductivity among various thermal properties. The thermal conductivity of isolation-heat paint is measured by laser flash method. We also study thermal conductivity evaluation of paints by comparing heat flow meter measurement results before and after application of heat paints to building materials.

PT-164 [무기/재료]

Adsorption of metal ions using the membrane of vertically aligned carbon nanotube

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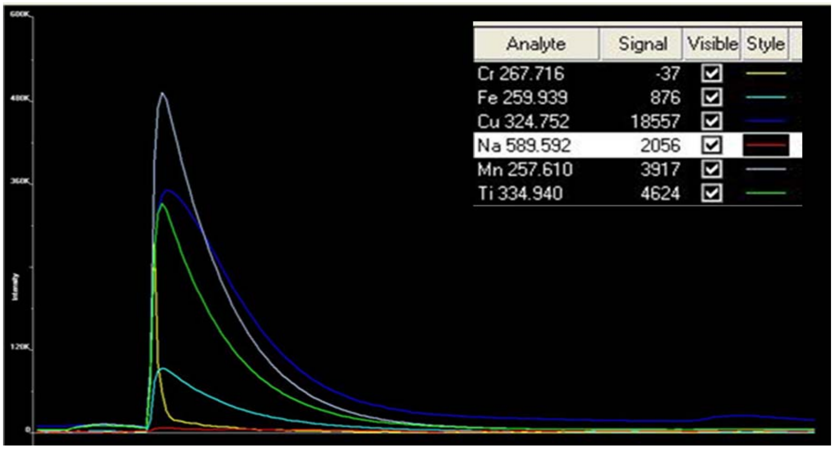
Our preliminary studies on the adsorption of heavy metals on vertically aligned carbon nanotube (VA-CNT) membrane filter showed that a filter have great potential as promised adsorbent. VA-CNT was provided from School of Energy and Chemical Engineering, UNIST, in Korea. The mixed elemental solution was prepared and adjusted to pH 10.1 with 2.0M NH_4OH and precipitations were removed by centrifugation (9000 rpm, 15 min). This test sample solution contains trace metal ions (Cr, Fe, Mn, Ti, etc.) for each level of 10 ㎍/kg and matrix elements (Na, K, etc.) for each level of 1000 ㎍/kg. This solution was passed through the VA-CNT membrane filter at a flow rate of 0.03 mL min^{-1} by using a peristaltic pump and uptake an aliquot of 5 mL filtered sample. After washing the VA-CNT filter with deionized water, the retained ions in VA-CNT filter were eluted with 2.0 M nitric acid at a flow rate of 0.2 mL min^{-1} by using a peristaltic pump. The effluent was on-line connected with ICP-OES system. The signals of desorbing ions from VA-CNT membrane filter are shown in Figure below. The analytical results of metal content comparison with before and after passing through CNT filter, the most content of Fe, Cr, Mn, Ti in sample was adsorbed in VA-CNT membrane filter, but Na, K were passing through without adsorbing. From these results, we expected to this membrane filter can be used as a tool for pre-concentration of trace metals and removal of high concentration of sodium matrix such as sea water.



Analyte	Signal	Visible	Style
Cr 267.716	-37	☑	—
Fe 259.939	876	☑	—
Cu 324.752	18557	☑	—
Na 589.592	2056	☑	—
Mn 257.610	3917	☑	—
Ti 334.940	4624	☑	—

[1] Renu, Madhu Agarwal and K. Singh, *ournal of Water Reuse and Desalination* 07.4 (2017) 387.
[2] Anna Stafiej, Krystyna Pyrzynska, *Microchemical Journal* 89 (2008) 29.
[3] Feng Du, Liangti Qu, Zhenhai Xia, Lianfang Feng, and Liming Dai, *Langmuir* 27 (2011)8437.

PT-165 [무기/재료]

Optimization of analysis method for trace elements in tantalite ore by ICP-OES

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Optimization of analysis methods about suitable sample digestion and overcoming matrix effect for trace elements in tantalite ore by ICP-OES was studied. Conventional mixed acid digestion, microwave assisted acid digestion, Na_2O_2-NaOH fusion methods were used for decomposition of tantalite ore and that were analyzed by ICP-OES without separation process of coexisting Ta and Nb in matrix. Trace elements as Cu, Mn, Mo, Ni, Pb, Ti, W, Zr had spectral interference by ICP-OES analysis due to high contents of Ta and Nb in matrix. IEC(Inter-element correction) and MSF(multicomponent spectral fitting) were used for ICP-OES analysis in order to overcome that spectral interference, and the results were compared with the analysis results by ICP-MS. As a result of trace elements analysis in tantalum ore by ICP-MS and ICP-OES, the spectral interference of ICP-OES analysis by coexisting Ta and Nb could be overcome by IEC and MSF correction. Additional researchs are needed for more quantitative results of trace elements in tantalite ore by certified reference material of tantalite ore.

PT-166 [무기/재료]

A study on wet chemical analysis, ICP-AES, XRF determination of major elements in clay minerals and their characterization

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Clay minerals are raw materials such as ceramics, cement, refractory bricks, and lubricants. It is most widely used as earthenware raw material for abrasives, filters, adsorbents, papers and petroleum refining. In order to improve the added value and to improve and develop the production technology, it is necessary to obtain the accurate evaluation analysis result for the raw materials of each manufacturer. In order to confirm the main component, it is required to carry out absolutely necessary reliable quantitative analysis of major elements by instrument and chemical quantitative analysis. In this research, the characteristics were confirmed and quantitative analysis by wet chemical analysis, ICP-AES and XRF.

PT-167 [무기/재료]

Surface characterization of porous nanomaterials in environmental applications

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In previous work, we present a simple and general method to fabricate PB/reduced graphene oxide foam (RGOF) via one-step hydrothermal method for the efficient removal of 137Cs. This macro porous network allowed rapid cesium ion diffusion into three dimensionally connected PB, while the interconnected graphene sheets provided excellent mechanical integrity and served a high adsorption capacity (18.67 mg/g) to the PB. An adsorption isotherm was fitted well by the Langmuir model with a linear regression correlation value of 0.97. The 3D macro porous adsorbents showed excellent removal efficiency of over 99.5% 137Cs from contaminated water (87.49 Bq/g).

To characterize the Ca-alginate beads, The SEM images were acquired using an FE-SEM (NNS450, FEI) at various acceleration voltage of 5 to 15 kV. The FTIR spectra were recorded using a Jasco FT/IR-6600. The XRD patterns were collected using a Bruker D2 PHASER (Germany) diffractometer with Cu Kα radiation. The BET surface area and average pore diameter were obtained from the N2 adsorption/desorption isotherm using a fully automatic physisorption analyzer (ASAP 2020, Tristar). The XPS measurements were obtained using a Thermo Scientific, K–Alpha electron spectrometer with an Al X-ray source. UV-vis analysis were carried out using a V770 (JASCO) spectrophotometer. The mechanical properties were measured using micro-indenter measurements (Noise Is a Signal (NIS), customized). The inductively coupled plasma mass spectrometry (ICP-MS) measurements were carried out using a PerkinElmer ELAN6100. The radioactive cesium activity was measured using a High Purity Germanium (HPGe) detector (Canberra, USA).

Especially the surface analysis of this porous nanomaterials by scanning electron microscopy meet with a difficulty to get a clear cross-sectional SE image. The porous nanomaterial, Ca-alginate beads and other composite such as alginate/AIP clay composite, P-MSC composite were hard to get a clear cross-section of sample. The material was soft texture as marshmallow which cause the structure collapse by blade cutting. Other problem was electron beam damage on the sample. The electron microscopy beam source occurs shrinkage and carbon contamination of the samples. In this study, we present successful example of surface characterization of porous nanomaterials in environmental applications. Technical description of sample treatment has been demonstrated.

PT-168 [무기/재료]

An experimental study of material characteristics of lime mortars used for Namhansanseong Yeojang

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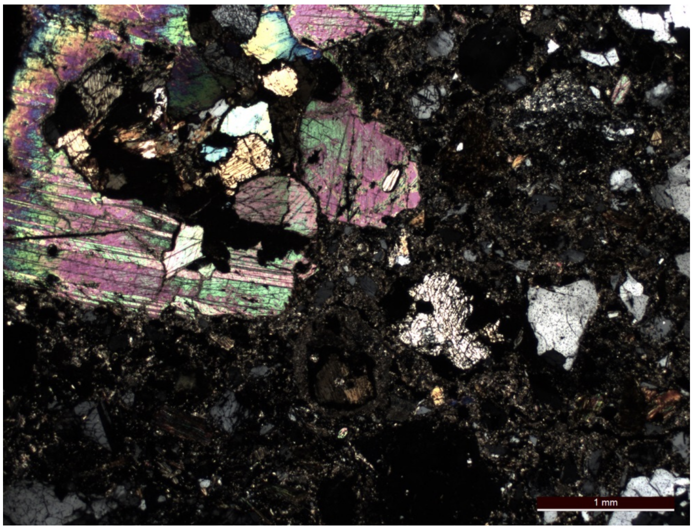
This study analyzed the lime mortars were collected from Hanbongseong to investigate the material characteristics of lime mortar used for Namhansanseong Yeojang. The thin section samples were observed by microscope to identify the major composition of lime mortars. In addtion, X-ray diffraction analysis was performed to identify the minerals constituting the lime mortars and SEM-EDS was used for the microstructure and qualitative analysis. According to analysis, the major constituent minerals of lime mortars uesd in the Hanbongseong were quartz, feldspar, mica, pyroxene and the main components are Si, Al and Ca. The results of this study are provide the data for restoration of traditional lime materials used in the Joseon Dynasty architecture.



PT-169 [무기/재료]

Determination of platinum group elements using fire assay

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It is economically important to accurately determine the platinum group(Au, Ag, Pt, Pd) in trace amounts. Pt and Pd are often calculated as a platinum group such as Au and Ag. Au and Ag are quantitatively determined by the fire assay method, but analytical methods for Pt and Pd are rare. In this study, PGE(Platinum Group Elements) was extracted in the form of Ag and ingot by fire assay, and acid decomposition was carried out to quantify it with ICP-OES. Au and Ag as well as the fire assay of PGE, the melting conditions, the mixing ratio and the temperature condition setting were studied to extract the optimum ingot in the PGE fire assay. The effects of wavelength interference and detection limits on acid concentration and Ag concentration in ICP-OES were investigated.

PT-170 [무기/재료]

Determination of decomposition intermediates of oxime-based extractants

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Recently, the price of cobalt, which is the raw material of secondary battery, has been rising due to the impact of environmentally friendly cars triggered by diesel gates, which are forming high prices. Cobalt is mainly obtained as a by-product of copper smelting and nickel smelting processes. As a by-product of wet copper smelting, methods of using DSX(Direct Solvent Extraction) as a mixed extracting agent of oxime crab extract(5,8-diethyl-7-hydroxy dodecane-6-hydorxyoxime, LIX 63) and carboxylic acid(Neodecanoic acid, Versatic 10 acid), which are commercially produced by some research institutes, have been studied for recovery of cobalt. However, the oxime-based extractants have a higher price than the excellent extracting efficiency and decompose the extractant due to hydrolysis. These decomposition intermediates include acyloin(5,8-diethyl-7-hydroxydodecan-6-one), diketone(5,8-diethyl-6,6-dodecanedione) and keto-oxime(5,8-diethyl-6,7-dodecanedione monooxime), which eventually decompose into hydroxylamine, Carbon dioxide and water. Quantitative analysis of oxime and decomposition intermediates(Acyloin, Diketone, Keto-oxime) is important to identify degradation mechanisms and control decomposition reactions. In this study, each substance was quantified using GC-FID.

PT-171 [무기/재료]

Comparative analysis of trace elements in clay minerals by ICP-OES, ICP/MS

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The clay minerals are used in various applications such as plastic clay, refractory clay, brick clay, tableware clay, glaze clay, bentonite and so on. Among them, tableware clay, oil-based clay, and clay-based clay are widely used in kitchenware and the like. Therefore, there are trace elements in the cray that are beneficial or harmful when used in daily life. In this study, the content of trace elements in representative clay minerals was investigated by quantitative analysis with ICP-OES and ICP/MS.

PT-172 [무기/재료]

The metal-fe disintegration and analysis method used $HgCl_2$

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The luppe, DUST test piece used as the recycling test piece among the steel progress in the steelmaking, minimill, and etc. is increasing in the usability in the cost saving aspect. And the analysis headlines is the Metal-Fe ingredient content among the sample ore. The Metal-Fe ingredient analysis is analyze with the $K_2Cr_2O_7$ titrator due to the $FeCl_3$ disintegration and EDTA titration law due to the bromine-methanolysis and the problem is in the analyst safety by the analysis deviation and toxic gas suction according to the analysis method. The Metal including the Metal-Mn among the $K_2Cr_2O_7$ titrator due to the $FeCl_3$ disintegration the test piece, Metal-Zn, Metal-Al, and etc In the titration included Metal ingredients are together disassembled it disassembles the ingredient is included The Metal-Fe Data comes out highly. With the analyst safety by the Br gas inhalation the EDTA titration law due to the bromine-methanolysis is disassembled It is the analysis lead time with the long time disturbance and the quick fair analysis support is difficult. The decomposing the $HgCl_2$ reagent fixed quantity in the test piece disintegration in this research these problems are concluded It deposits in the flask and the Ar inactive gas is dropped inside the flask and it is not oxidized in the test piece disintegration The other except Metal-Fe which establishes the condition including the decomposition temperature, resolving time, and etc. and is included among the sample ore The method of pre-treating and analysis method that doesn't get the impact on the Metal ingredient is established. Therefore The Metal-Fe analysis accuracy could be improved.

PT-173 [무기/재료]

Research and development of eco-friendly mineral engine oil

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Such mineral substances as carbon black, molybdenum and tourmaline make abrasivity of the friction surface, so they have mostly been used for lubricants of aerospace and heavy equipment. Even though they are mineral substances with excellent lubricating performance, they are deposited in the oil. That's why they are not currently used for engine oil. To develop mineral substance engine oil that is not deposited during idling state of engines, Hannam University and Partsner Automotive Technology Institute started to research high performance engine oil whose particles are not deposited by using repulsive power among nano-particles of mineral substances.

In this study, we used Ball mill crusher to process mineral substances into nano-particles evenly, and for the mineral substances, acetylene 50% and 100% Compressed Carbon black of Alfa Aesar and 99.9% pure 93-4275 Molybdenum and Tormaline of STREM were selected. To prevent mineral substances from being deposited, we used BYK-P 104S, DISPERBYK-180 and DISPERBYK-111 dispersant, and for oil, we used gasoline engine oil of Hanaro KM. We mixed oil, mineral substances and dispersant and acquired specimen oil by stirring the mixture at 50℃ for 30 minutes, and then we measured abrasion loss of iron and viscosity. For the measurement, PQM iron abrasion loss measuring instrument and SPECTRO-VIS(ASTM D445) were used, and the quantity of sample was 2ml and 5ml each.

The oil with mineral substances mixed had better metal abrasion rate than regular oil, and the sediment index was decreased when the dispersant was injected.

PT-174 [무기/재료]

Determination of silicon in biodiesel by ICP-AES

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As an alternative to oil-based diesel, research groups have developed biodiesel based on renewable resources such as vegetable oils and animal fats. In using biodiesel, evaluation of biodiesel resistance of diesel fuel tanks is required. Especially, accurate analysis of silicon component both in diesel tank materials and biodiesel fuels is important because it is directly correlated with environmental and quality characteristics of biodiesel. However, it is not easy to decompose for determining the chemical components and there is a risk of explosion or fire in general decomposition methods since biodiesel has high carbon content.

In this study, the biodiesel sample was extracted with aqua regia solution without using explosive sulfuric acid and perchloric acid. The extracted solution was dried and melted in flux, analyzed by ICP-AES. Samples in which the oil component was completely removed were quantitatively analyzed using a calibration curve of a matrix-matched standard solution. As a result, the developed biodiesel analysis method has been verified.

PT-175 [무기/재료]

Study on fracture of automobile clutch diaphagm in spring steel

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Recently, the automobile industry has attempted to reduce car weights to satisfy environmental regulations restricting automobile exhaust fumes and to enhance fuel efficiency levels.

Weight reductions are generally attained by strengthening a material to take the same amount of load with less volume. For this purpose, vanadium added 50CrV4 spring steels have recieved attention in the automobile industry, due to the excellent combination of strength and ductility. However, it has also been reported that high-strength steels are vulnerable to embrittlement, as the notch sensitivity increases with an increase in the strength of the material. Present study aims to clarify the cause of crack initiation in diaphragm spring steel. The authors confirmed that crack initiated at heat treatment process. These failure anlaysis was discussed in terms of the microstructural analysis and micro hardness test.

PT-176 [무기/재료]

Clamping process for delayed fracture mechanism of ear-type band

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Da-Hee Cho[2], Joong-Cheul Park[2], *
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Delayed failure analysis on ear-type band which was made with STS301 stainless steel was carried out. In order to investigate delayed fracture mechanism of ear-type band, chemcial composition analysis, micro hardness test, microstructural analysis and delayed fracture test was conducted. Using this analysis, an analytical solution for delayed fracture characteristics of ear-type band steel was proposed.

PT-177 [무기/재료]

Study on the determination of boron in cathode active material of lithium ion battery by ICP-MS

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Recently lithium secondary battery has been a hot issue as a power source for not only portable electronic devices but also electric motors. Among various cathode active materials, $Li(Ni_xCo_yMn_{z)}O_2(x+y+z=1)$ (NCM)is one of the most prominent and representative materials for high capacity and efficiency. Since the analysis of trace elements is very important for developing efficient cathode materials of NCM, the determination of trace impurities, such as Na, Mg, etc., or additiveelements, such as Al, B, etc., is often required for the improvement of quality. Among them, boron is an interesting element for high efficiency of NCM in lithium ion battery. However, boron is converted into a highly volatile complex compound, it can easily be lost during sample treatment, which makes the determination difficult.

In this work, we studied the analytical method to determine boron in NCM using ICP-MS. For higher accuracy and precision, external standard, internal standard, and the standard addition method were performed for calibration and the results were compared. The coefficients of determination (R^2) for calibration curves were assessed above 0.999 and the limits of detection were as low as 0.09946 ng/mL. In addition, the uncertainty of measurement was studied for standardization, which was based on identifying, quantifying and combining all the associated sources of uncertainty separately. The contents boron in NCM sample was 0.07613% (w/v) and the expanded uncertainties values (± 0.01102%) were obtained in our primitive estimation.

PT-178 [무기/재료]

Optimization of GD-MS analysis according to Cu specimen type

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For trace element analysis using GD-MS, the ionization depends on the ions density difference in the GD cell. The ionic intensity of the matrix element is important for the analysis of trace elements, we have researched the change of the ionic intensity according to the shape and length of the sample. In this study, Cu samples were prepared by pin type according to length (9 ~ 19mm, at 2 mm interval), and the intensity was compared and analyzed. As a result, it was confirmed that the highest ion density was obtained at 11 mm and 13 mm samples at 1.1×10^9 cps.

In the optimized pin specimen, the plate specimen showed a copper intensity of 2.8×10^9 cps, about 3 times higher, although the analytical area was 5.02 cm2 and slightly smaller than the pin type specimen of 5.96 cm2 (at pin length 11 mm). As the length of pin specimen increased, the analysis area increased but the ionic strength decreased. Because of the ion intensity decreases as the ions hit the wall of the pin sample and the ions become neutralized when the ions escape to the exit slit. However, in the case of the plate sample, most of the ions could be detected without decreasing the ion as the pin sample.

PT-179 [무기/재료]

Study of analysis for oxide powder by glow discharge mass spectrometer

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Glow discharge mass spectrometer(GD-MS) mainly use to analysis conductive materials. However, analysis of rare earth materials or oxide materials are required, recently.

In this work, study of analysis for silicon oxide(standard material, BCR-2(USGS)) using secondary cathode. Three materials(copper 99.99 %, Indium 99.999 %, Tantalum 99.999 %) were chosen with the secondary cathode. The sample powders were placed on three secondary cathodes, respectively. Silicon ion intensity with three secondary cathodes are compared. In case of silicon ion intensity with copper and tantalum was indicated at 5 X 10^8 CPS. In case of silicon ion intensity with indium was indicated at 3 X 10^8 CPS. Because of indium metal is flexible, It is difficult that control of sample powder volume. In case of silicon ion intensity with copper and tantalum was obtained high ion intensity, equally. However, when was analysis using copper, many mass interference is generated because of copper. Also, many impurities as Fe, Ni, Zn, Cr, etc in copper were detected. Nevertheless, tantalum has high mass, which does not significantly affect the interference. And impurities was not detected except for niobium. Thus, among the three secondary cathodes, tantalum was best and optimized for quantitative analysis.

PT-180 [무기/재료]

Development and analysis of environmentally friendly cleaning agent

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When manufacturing electronic equipment, solder is applied to the printed circuit board (PCB). After soldering, a cleaning agent is used to remove flux and solder paste remaining on the printed circuit board. PCB cleaner is a substance that is very harmful to the human body and is currently regulated as a commonly used TCE. Thus, a variety of alternative detergents have been created to replace hazardous detergents such as TCE. Many alternative detergents are currently on the market, but methods for evaluating these detergents have not been established.

Therefore, in this study, ethanol-based detergents were prepared and compared with cleaning agents sold on the market. To evaluate the cleaning efficiency, three types of substrates were contaminated and cleaned with the developed cleaning agent. The cleaning efficiency was evaluated by gravimetric method, and the surface of the substrate was confirmed by OM and SEM. The components were analyzed using GC-MS.

The results of the gravimetric analysis showed that the cleaning efficiency was close to 97~100% in most cases, but cyclohexane appeared lower than 80%. OM and SEM analysis qualitatively shown the difference in cleaning power between the cleaning agents. Specially, OM and SEM analysis showed that dimethoxymethane and MMB (3-methoxy-3methyl-1-butanol) were superior to other detergents.

Results of this study are expected to be used to a detergent development with human-friendly in various fields such as semiconductor, electronic equipment, etc.

PT-181 [무기/재료]

Dispersion and characterization of environmentally friendly water soluble lycopene pigment particles

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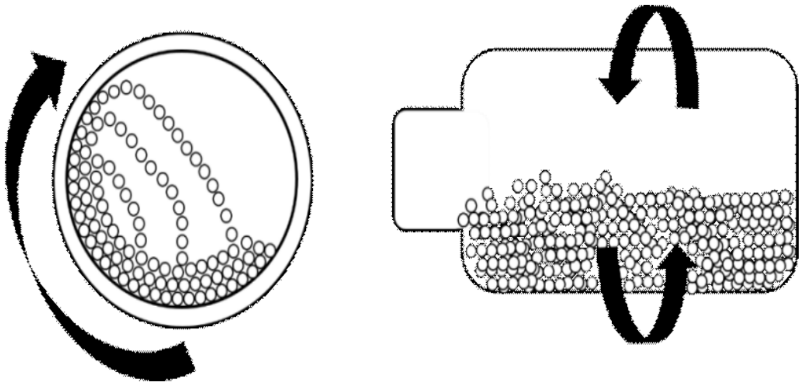
Lycopene is a natural pigment that is contained in red vegetables and fruits and is one of carotenoid. Lycopene has long been known to have strong antioxidant activity. Interest in lycopene has been increased as it has become known that it is particularly helpful in the prevention and treatment of prostate cancer. However, in general, carotenoid pigments are fat-soluble and highly unsaturated. Therefore, it is easily oxidized and destroyed by heat, light, and oxygen.

In this study, lycopene aqueous solution was prepared using lycopene crystal, Tween 80, and distilled water. Then, experiments were conducted to make the size uniform by using a ball-milling dispersion system. Dynamic light scattering (DLS), asymmetrical flow field-flow fractionation (AF4), optical microscope (OM), pH meter, conductivity, and color meter were used for characterization of uniformly prepared aqueous solutions of lycopene. As a result of the experiment, it was confirmed that the dispersion degree increases and the color becomes brighter as the content of Tween 80 and the rpm of the ball mill increase. It was also confirmed that they were kept stable without separation during storage at room temperature.

The aqueous solution of lycopene developed through this study is expected to be used as a material with high stability in various fields such as cosmetics, foods, medicines.



PT-182 [무기/재료]

Development and characterization of environment-friendly flavoring agent

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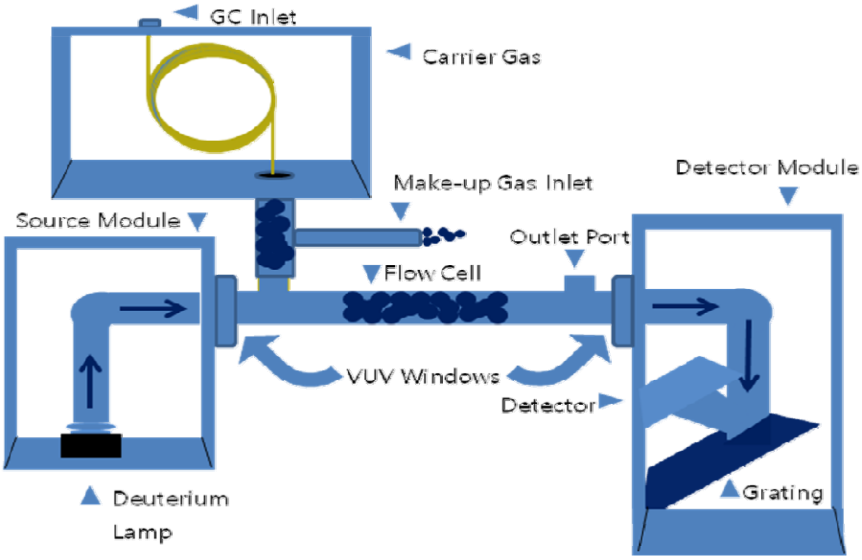
Recently, social problems have been emerging due to the detection of harmful substances among the products we use. Thus, consumers are becoming increasingly interested in green products and health products. Among many products, eco-friendly fragrance that is used for both the perfume we spray on our skin and the processed food that humans consume is necessary. Therefore, it is time where the development of environmentally friendly fragrances is essential.

The synthetic strawberry fragrance we used in this experiment was synthesized by mixing the base component and the additive component, and was analyzed by GC-VUV and GC-MS. The toxic substances Butyric acid methyl ester and 2-Ethyl hexyl acetate, which were not detected by the GC-MS, were detected as a by-product in GC-VUV analysis. As a result, it was confirmed that more harmful substances were detected in the natural fragrance.

As a result of this study, GC-VUV is expected to be used as a powerful analytical technique in the analysis of harmful substances in the field of fragrance and cosmetics.



PT-183 [무기/재료]

Synthesis and characterization of ceria nanoparticle dispersant

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Ceria is an oxide of cerium, also called cerium oxide. This metal is mainly used for removal of glass film, polishing of a substrate, and the like. In particular, the stability of the ceria particles is one of the most important factors because the risk of scratches increases when the ceria does not have a uniform size during polishing.

In this study, ceria abrasives with different dispersant contents were prepared and their changes in the properties with time at 10℃ and 60℃ were measured. Also the optimum condition for size distribution of ceria slurry and stability test of ceria nanoparticles were conducted. The pH change was measured with a pH meter to compare the abrasive powder immediately after storage and after 2 hours. The viscosity and conductivity meter were used to confirm the physical properties. Dynamic light scattering (DLS) was also used to measure the size. As a result, the conductivity of the dispersant tended to increase slightly regardless of the content and temperature of the dispersant. The pH tended to decrease with increasing the content of dispersant except for the content of dispersant of 4% at 60℃ and increased at 10℃ as the content of dispersant increased except for the content of dispersant of 4.5%. As a result of DLS measurement for 3 months, the size slightly decreased with increasing temperature and the size slightly increased with decreasing temperature regardless of the content of dispersant. Therefore, it was possible to develop abrasives with high long-term storage stability.

The abrasives developed through this study are expected to be highly utilized in semiconductors and various industries.

PT-184 [무기/재료]

Study on the stability of abrasive ceria nanoparticle slurry

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Ceria is an oxide of cerium. This metal is used for polishing-related operations of the substrate. Such ceria is a slurry material used for polishing wafers used in semiconductors. The slurry disperses the ceria particles using a dispersant in the production process, and keeps the ceria particles at a constant size to polish the wafer.

At this time, when the ceria particles in the slurry lose their dispersing ability or the temperature changes, the particles become large and affect the wafer polishing quality, thereby producing defective products.

In this study, the slurry prepared to confirm the stability of each SMA dispersant was measured the change in the properties of slurry after 0 h and 2 h at 60℃ and 10℃. A pH meter was used to check the pH change, and a viscometer and a conductivity meter were used to check the physical properties. Moreover, DLS was used to measure size distribution. As a result of study, pH, viscosity and size of slurry are stable at 60℃, but the conductivity has a tendency to increase. At 10℃, pH, conductivity, viscosity and size were almost constant.

Therefore, it was possible to develop a stable SMA based slurry for ceria particle, and the slurry developed through this study is expected to be highly utilized because it remains stable in the actual process.

PT-185 [무기/재료]

Development and characterization of high efficiency fine dust filter

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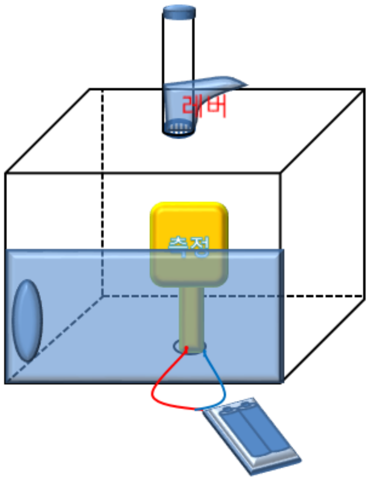
Fine dust is mainly emitted from automobile exhaust gas or factory chimneys, and refers to small dust particles that come out in China's yellow dust or severe smog. Fine dust is PM(Particulate Matter)10 with dust less than 10 μm in diameter. Fine dust particles with a smaller particle size are called ultra-fine dust particles and have a diameter of less than 2.5 μm (PM 2.5). Fine dust is a first-level carcinogen designated by the World Health Organization and is at risk of being exposed to various diseases as well as respiratory diseases.

Therefore, we researched to develop a filter that has highly efficient filtration of fine dust. First, diazonium salt was synthesized and a polymer was formed on a HEPA (High Efficiency particulate Arrestor) filter using a UV curing machine. ATR-IR and SEM were used to confirm that the polymer was adhered to the HEPA filter. Then, the fine dust filtration efficiency was measured using a fine dust meter.

As a result of the measurement, it was confirmed that the filter formed with the polymer using diazonium salt had a higher fine dust filtration efficiency. Therefore, it is expected that the fine dust filter developed through this study will be applied not only to the mask but also to the exhaust gas outlet of the automobile.



PT-186 [일반]

Development of commonly applicable HPLC assay for raw materials and finished product of Rifampicin in KP 11

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In pharmaceutical companies that manufacture finished products (FPs), quality control for raw materials and FPs is carried out simutaniously according to KP test methods. However, in some cases, quantitative HPLC assay of raw materials and FPs are different from each other in terms of chromatograpic system (such as column, mobile phase and temperature and so on.). If the KP presents common applied assay for raw materials and FPs with improved accuracy and convenience, the convenience of the company will be improved and utilization of KP will be increased.

The purpose of this study is to develop a test method that can be applied commonly to raw materials and FPs by examining the cases of different operating conditions of HPLC system such as mobile phase, column, and temperature in KP.

In KP, we investigated the monographs of raw materials and FPs with different operating conditions of HPLC assay method and considered the production records in recent two years. As a result, 'Rifampicin' and 'Rifampicin Tablets', which is antituberculosis drug, were selected as target items.

Common assay of 'Rifampicin tablet' was prepared by applying the HPLC operation condition of 'Rifampicin'. This test method is economical because less amount of reference standard is needed compared to the current KP 'Rifampicin tablets' test method, and also we established new system suitablity method. We conducted validation process and developed a common assay method for 'Rifampicin' and 'Rifampicin tablets' by evaluating the specificity, linearity, precision, accuracy (recovery) and inter-laboratory validation. The reproducibility of the developed method was confirmed by Rifampicin raw material and FPs. As a result, the HPLC assay that can be commonly applied to the raw materials and FPs of KP Rifampicin has been successfully developed.

[Acknowledgement] This research was supported by a grant (17171MFDS167) from Ministry of Food and Drug Safety in 2017.

PT-187 [일반]

Introduction to analytical method of zinc and calcium isotope using multi-collector ICP/MS

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Analysis of naturally occurring isotopic variations is a promising tool for investigating Zn and Ca transport and cycling in geological and biological settings. To establish stable isotopes (Zn, Ca) analytic techniques, we evaluated the instrument conditions, correction method of mass fractionation and necessarily minimum sample concentration. Instrumental mass bias was corrected using the "sample-standard bracketing" method, and compared with "Internal standardization" with Cu doping for only Ca isotope analysis. After evaluating the potential effects of varying fractionation, Zn and Ca isotope data were obtained with an higher precision better than %RSD < 0.1 %, % bias < 0.01 % and %RSD < 0.044 %, % bias < 0.0028 % respectively, over a period of 5 months. For Ca isotope analysis, it should be consider the isobaric effect to minimize the interferences such as $^{40}Ar^+$, $^{41}K^+$, $^{47}Ti^+$, $^{87}Sr^{2+}$. To remove an isobaric interference of $^{40}Ar^+$, the radio frequency (RF) power was reduced from 1300 to about 575 W, so-called "cool plasma". The standard-sample bracketing method was used in correction of Ca isotopic ratios for mass fractionation. The precision (%RSD) of $^{42/40}Ca$, $^{43/40}Ca$, $^{44/40}Ca$ were 0.028, 0.097, and 0.044 %, and the accuracy (%bias) were -0.0012, -0.0079, and 0.0028 %, respectively. The results imply that Zn and Ca isotopic ratios measured in our multi-collector ICP/MS system can be used in tracers for the environmental pollution.

PT-188 [일반]

Property of cations and isotopes of national groundwater monitoring wells

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The national groundwater monitoring wells (approximately 500 sites) in South Korea are widely distributed throughout the nation. Variables such as EC, pH, T, DO, BOD and COD have been measured by National Groundwater Information Center in order to monitor and sustain water chemistry/quality. Recently, groundwater samples in the wells were collected two times in the early June and July 2015, and then major cation concentrations and multi-isotopes were analyzed in the Korea basic science institute. The objective of this study was to supply the range of cation concentrations and multi-isotopes and furthermore to characterize water chemistry for national groundwaters. The concentrations of Ca, Mg, Na and K ranged from 22 to 62 ppm (average 59.3 ppm), from 3.86 to 13.7 ppm (average 17.2 ppm), from 11.7 to 31.7 ppm (average 65.6 ppm) and from 1.45 to 3.48 ppm (average 4.00 ppm), respectively. Most water samples showed the relatively high proportion of Ca, compared to Na+K. For oxygen and hydrogen isotope compositions of groundwater, $\delta^{18}O$ and δD values for samples in June ($\delta^{18}O$: -7.5±1.1‰, δD: –52±8.1‰) was more enriched than those in July ($\delta^{18}O$: -8.1±1.0‰, δD: -54±7.9‰). Relationships between $\delta^{18}O$ and δD in June and in July were expressed by the equations of $\delta D = 6.9\times\delta^{18}O + 5.12‰$ and $\delta D = 7.4\times\delta^{18}O - 0.36‰$, respectively. On the plot of $\delta^{18}O$ and δD, the groundwaters were not largely away from the local meteoric water line (LMWL) reported in South Korea. The spatial variation of groundwater isotopes would be mostly explained by latitude and altitude effects. Sr isotope ratios ($^{87}Sr/^{86}Sr$) for groundwater samples showed a wide range from 0.7054 to 0.8611, and ca. 92% of the samples ranged from 0.7054 to 0.7380. The $^{87}Sr/^{86}Sr$ range for groundwater was within those for rocks (e.g. mainly silicate rocks) distributed in South Korea, indicating that hydrogeochemical characteristics of groundwater can be determined by chemical weathering occurring in watershed. Isoscapes were illustrated on the basis of water isotopes and $^{87}Sr/^{86}Sr$ ratio for groundwater samples. We expect that the Korean isoscapes can be efficiently used by many scientists in multi-disciplinary fields of study.

PT-189 [일반]

REE extraction methods in organic matter in river and marine sediments

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The REE of the aquatic environment is precipitated by biochemical processes such as carbonate, Fe-Mn oxide / hydroxide, organic matter, and detrital phase in sediment. In particular, REE analysis of organic matter is being used to track the environmental characteristics (eg, continental and marine environments) at the time of its formation. This experiment was carried out to analyze the distribution of REE and Nd isotope in organic matter extracted from various sediments and sedimentary rocks as a basic data to track the environment of organic matter production. For this purpose, soil standard materials (NIST 2709), steel sediments (Jsd-2), marine sediments (GSMS-2) and shale reference materials (SBC-1) were used. Alkali fusion method was used in which each standard material was burned in a reaction furnace, and then the Fe-Mn oxide / hydroxide precipitated in the solution was dissolved using 4 M HCl solution. As a comparison, carbonate and Fe-Mn oxide / hydroxide were removed from 0.25 M HCl from each standard, and organic fraction was extracted with a mixture of 30% hydrogen peroxide and 0.02 M HNO_3. Compared with bulk samples, the REE / PAAS normalized pattern of organic fraction shows that MREE (Sm ~ Tb) is higher than LREE and HREE. In this experiment, further experiments are underway to compare / analyze the isotope ratios of Nd elements in bulk samples and organic fractions prepared from standard materials.

PT-190 [일반]

Lead isotope analysis using a MC-ICPMS

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Lead (Pb) is toxic element and widely distributed in the Earth´s crust at trace levels. Pb has been released to the atmosphere with industrial activities such as smelter, mining, combustion of fossil fuels, and use of leaded gasoline, causing serious environmental contamination. Pb isotope ratios can be used to trace the source of Pb pollution and to understand of the biogeochemical cycling of Pb in the environment. Pb isotope ratios have mainly been determined using thermal ionization mass spectrometry (TIMS) and required two times column passage using both HCl and HBr. Although analytical technique for TIMS can achieve high precise and good accuracy in a sample containing a low concentration of Pb, it was time-consuming. Here, we developed advanced method using only HCl solution (2N HCl, 6N HCl) and one column passage and measured the Pb isotope ratios of USGS geological reference materials using multicollector inductively coupled plasma mass spectrometry (MC-ICPMS). It reached a Pb yield of more than 95% and was consistent with the reported values within the error range. We expected that this study will be used to determine Pb isotope ratios for various environmental samples.

PT-191 [일반]

Determination of trace metals and rare earth elements in seawater using flow injection-Triple quadrupole ICP MS

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A triple quadrupole Inductively coupled plasma - mass spectrometer(ICP-QQQ) can be effectively eliminated the mass interference with two separated quadrupole mass filter, especially through the mass-shift mode(O_2 reaction cell) or on mass mode.

Trace metals and rare earth elements in the seawater exist in trace amounts of μg / L to ng / L levels. However, there are high levels of salts such as sodium, magnesium and chlorine ions, and it is caused many interferences in ICP-MS. The total dissolved solids (TDS) is present in the seawater at about 3%, So matrix effect do not disappear through dilution. Therefore, for the determination of trace metal in seawater, it is necessary to concentrate the trace elements and remove the salt in seawater.

In this study, seaFAST (ESI) was coupled for the analysis of Triple quadrupole ICP-MS(ICP-QQQ). seaFAST is a flow injection system that uses ion exchange resin mixed with iminodiacetate and ethylene-diamine-tetraacetic acid to concentrate and remove salts from seawater samples. Since seawater is injected automatically into the analyzer through the flow injection system, there are several advantages that reduces pollution and lowers the level of the base and to not need pretreatment.

Trace metals and rare earth elements were determined using triple quadrupole ICP-MS (ICP-QQQ) for NASS-4 (NRCC) and SLEW-3 (NRCC), which are certified standards for seawater and estuary. As a result, trace metals in the seawater were found to be consistent with the certified values, and rare earths were also found to agree with the reported values.

PT-192 [일반]

Determination of Arsenic and Selenium with mass shift mode by triple quadrupole ICP-MS

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Arsenic is well known for metal that is toxic to human, many people have been exposure by various environmental source. Determination of total arsenic concentration in environmental sample is requested to lower detection limit because it is existed at trace level. Therefore, ICP-MS is powerful analytical tool for Arsenic determination. However, arsenic is a mass 75 and monoisotopic. So $^{40}Ar^{35}Cl$ highly affects determination of arsenic in matrices with highly concentration of chloride, like biological and seawater sample [1].

Selenium is a necessary micro-nutrient in the human body, but ingestion of large quantities may cause acute poisoning [2]. Determination of Selenium in environmental sample is difficult that concentrations of Se are low naturally. Moreover, selenium isotopes are six, masses m/z 74, 76, 78 and 80 are interfere by argon dimers and the other two masse are affected by concentration of chloride.

In this study, we use triple quadrupole ICP-MS (ICP-QQQ) that has He reaction mode (kinetic energy discrimination) and mass-shift mode (O_2 reaction cell). An ICP-QQQ using mass-shift mode for As^+ from *m/z* 75 to AsO^+ at *m/z* 91 and Se^+ form m/z 78, 80 to SeO^+ at m/z 94, 96 [3]. It is increase the selectivity for target element.

For the comparison of matrix effect, 10 μg/L Arsenic in matrix, such as 1 % HNO3, 1 % HCl and 0.1 % HCl was determined by normal quadrupole ICP-MS and triple quadrupole ICP-MS (ICP-QQQ). Using the normal ICP-MS showed the greatest effect by chloride. When mass-shift mode (O_2 reaction cell) was used, arsenic was most accurately analyzed even at high chloride concentrations. Using mass-shift mode (O_2 reaction cell) for determination of selenium, the interference of argon dimer was removed and concentration of selenium present in a trace amount was determined.

[1] J. An, J. Lee, G. Lee, K. Nam, H. Yoon, *Microchemical. 120* (2015) 77-81.
[2] J. Sucharová , *J. Anal. At. Spectrom. 26 (2011),1756-1762.*
[3] B. P. Jackson, A. Liba, J. Nelson , *J. Anal. At. Spectrom. 30 (2015),1179-1183.*

PT-193 [일반]

Case study on identification of mono-substituent organic substance

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DMPT (organic substance) samples were collected from two manufacturing companies and subjected to substance identification for registration. Structural identity was confirmed by Infra-red (IR) analysis using ATR and nuclear magnetic resonance (NMR) analysis on sample in $CDCl_3$. Compositional information was obtained by GC-Mass analysis on one wt % solution in methanol. The best separation of main constituent (para substituent) and its adjacent isomer(meta substituent) was obtained using HP-5 MS column with low polarity. The substance type was proved to be mono-substituent. Purity of main constituent and information on impurities are summarized. Constituents of two samples and the typical concentration of each constituent were compared. Possible SIP (Substance Identity Profile) was generated.

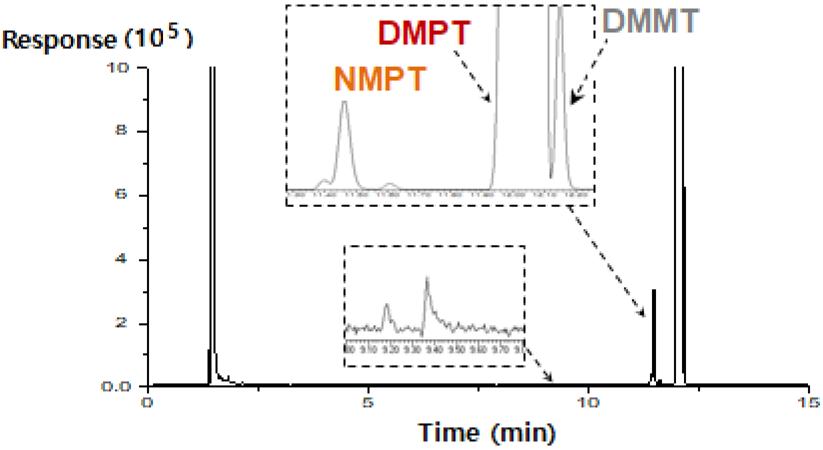

Figure 1. GC-MS analysis for compositional information

[1] ECHA, Guidance for identification and naming of substances under REACH and CLP, draft version 2.0, Oct. 2016.

[2] ECHA, Practical guide for SME managers and REACH coordinators, How to fulfil your information requirements at tonnages 1-10 and 10-100 tonnes per year, v 1.0, Jul. 2016.

PT-194 [일반]

Study on the analysis of formaldehyde in textile products by comparison of DNPH and nash method

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In spite of carcinogenicity, neurotoxicity and genotoxicity, formaldehyde (HCHO) is still widely used in industries related to food hygiene, air and water quality, cosmetics, textiles and other industrial products. For example, formaldehyde was registered as tonnage of 1,000,000 tons per year in REACH and other related 56 substances such as reaction products, oligomeric or polymeric reaction products were registered with various uses. Consequently, residual amount of HCHO is detected as free and partially released or emitted volatile forms in consumer products as well as new cars, houses and buildings. In case of textile products closely related to human contact, more strict restrictions are applied by product regulations and third-body certifications such as Oeko-Tex Standard 100.

In this study, KS K ISO 14184-1 (Nash method using UV spectrophotometer) as the current test method for Electrical Appliances and Consumer Products Safety Control Act and Children's Product Safety Special Act, and HPLC method using DNPH derivatization as an alternative method were compared. Experiments were carried out using different conditions from those of the conventional KS K ISO 14184-1 by changing the extraction solvent, pretreatment method, and derivatization method. It was focused on developing quantitative analysis methods with lower quantitation limits and higher recovery ratio for each method.

The DNPH method was proved to have better recovery ratio and lower quantitation limit than the existing methods, therefore satisfying the global regulatory standard (< 5 ppm)[1]. Also, HPLC method using DNPH derivatization is expected to to be used more widely than Nash method because it gives accurate quantification results to dyed textiles and leathers and any other colored samples as well as light-scattering emulsified samples such as cosmetics.

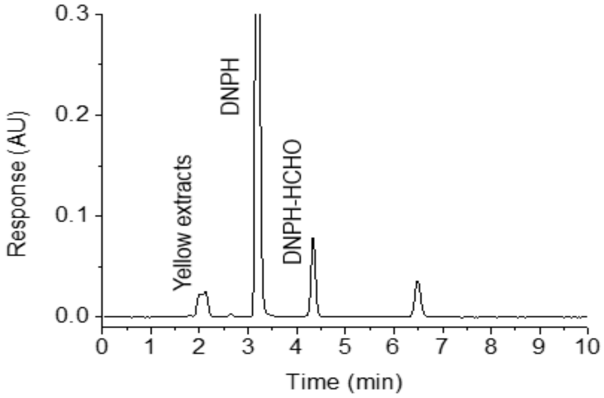

Figure 1. HPLC chromatogram for formaldehyde analysis

[1] CSPA, Washington Children's Safe Products Act – Reporting Rule – WAC 173-334, Dec. 2013.

PT-195 [일반]

Review on the process for substance identification and generating substance identity profile (SIP) based on REACH

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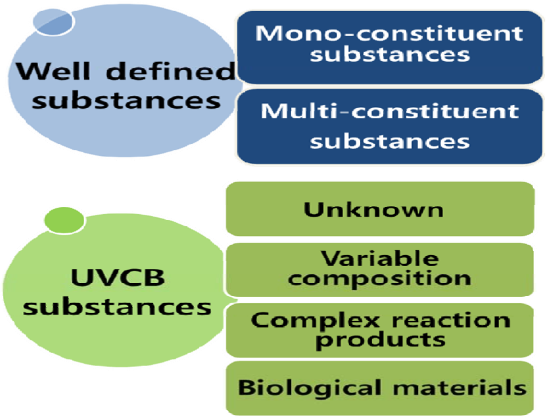
A substance does not necessarily contain one constituent, but can also consist of more constituents. There are three types of substances: mono-constituent, multi-constituent and UVCBs ((Substances of Unknown or Variable composition, Complex reaction products or Biological materials). Substance identification is the first step to implement any chemical legislation. Agreement on the scope of the substance identity covered by the registration is a pre-requisite to the joint submission. To facilitate the agreement of substance sameness, many SIEFs have created a substance identity profile (SIP), which describes the identification parameters such as substance name, constituents, concentration ranges and spectral data to be used. For UVCBs such as oleochemicals in which fatty acids are major products from hydrolysis of natural triglycerides as well as hydrocarbon solvents consisting of linear, branched of cyclic alkanes and aromatics with carbon chain length distribution of C5 ~ C20, other descriptors are needed in addition to information on composition. Illustrative examples will be presented from relevant documentary search [1-7].



[1] https://echa.europa.eu/regulations/reach/substance-identity
[2] https://echa.europa.eu/support/substance-identification/sector-specific-support-for-substance-identification
[3] ECHA, Guidance for identification and naming of substances under REACH and CLP, draft version 2.0, Oct. 2016.
[4] ECHA, Practical guide for SME managers and REACH coordinators, How to fulfil your information requirements at tonnages 1-10 and 10-100 tonnes per year, v 1.0, Jul. 2016.
[5] ECHA Manual, How to prepare registration and PPORD dossiers, v 4.0, May 2017.
[6] OECD guidance for characterizing oleochemical substances for assessment, No.193, Mar. 2014.
[7] OECD guidance for characterising hydrocarbon solvents for assessment purposes, No. 230, Jan. 2016.

PT-196 [일반]

Colorimetric dual sensor of Fe^{3+} and Hg^{2+} ions based on sequential detection by etching and aggregation of gold nanorods

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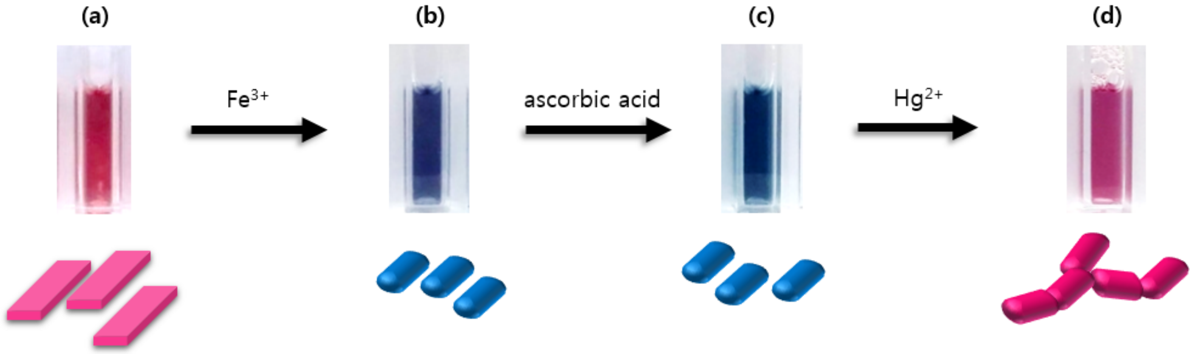
A sensitive and selective colorimetric dual sensing assay was developed using gold nanorods (AuNRs) for the sequential determination of Fe^{3+} and Hg^{2+} in aqueous samples. Iron ions (Fe^{3+}) was detected by etching AuNRs, affecting in the smaller nanorods, and mercury ions (Hg^{2+}) bonded or aggregated these AuNRs together under ascorbic acid. The AuNRs was synthesized by indicator (ligand) free for Fe^{3+} and stabilized for Hg^{2+} using ascorbic acid. This sequential detection process results in a dramatic color change from red to blue and finally back to red on unique reactant with AuNRs such as Fe^{3+} and Hg^{2+}. Therefore, the concentration of Fe^{3+} and Hg^{2+} ions in environmental samples can successively quantitate by the naked eye or by UV-Vis spectrometry using the proposed AuNRs sensor. The optimal conditions such as pH, temperature and ascorbic acid concentration in solution stimulated to a more rapid color change in the optimized AuNRs system. The absorption ratios (A_{640}/A_{740}) and (A_{550}/A_{640}) of the optimized AuNRs solution exhibited a linear correlation with the Fe^{3+} and Hg^{2+} ions with different concentrations ($y=0.5007x+0.1171$, $r^2=0.9877$), ($y=1.5101x+0.261$, $r^2=0.9986$) and with a limit of detection of 25.2 nM, respectively. This dual sensor allows sequential detection for Fe^{3+} ions and Hg^{2+} ions with one sensor.



PT-197 [일반]

Determination of metabolic pathway using ^{13}C-labeled microbial products by GC/TOF-MS

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Medium-chain carboxylic acids (C5-C7) are valuable chemicals which can be used in the production of polymers, pharmaceuticals and solvents. There are a range of ways producing these carboxylic acids, including chemical synthesis and biosynthesis. Among them, biosynthesis of carboxylic acids using microorganism has been continuously studied. In biosynthesis, it is essential to understand metabolic pathway of microorganisms. To obtain more robust estimations of metabolic pathway, labeling experiments are very powerful. Thus, valuable information may be gained from analyzing labeling patterns of metabolites when the microorganisms have been fed with a specifically labeled substrate.

In this study, we figure out the metabolic pathway by examining the medium-chain carboxylic acid produced by certain microorganism which have been fed ^{13}C-labeled propionic acid. These carboxylic acids produced by metabolism are analyzed by GC/TOF-MS. It is usually applied for analysis of labeling patterns due to the mass detecter capable of isotopic analysis. The mass spectrum data obtained is compared with the ^{12}C standard mass spectrum to identify the labeling position of the product. In conclusion, this labeling pattern study contributes to make metabolic pathway reliable in biosynthesis of medium-chain carboxylic acids using microorganism.

PT-198 [일반]

Development of an radioanalytical method for artificial radionuclide in seafood stuffs

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The objective of this study is to presents a quantitative and rapid analytical method for determination of Pu isotopes and ^{90}Sr in seafood samples using various procedures such as ashing, radiochemistry with an anion exchange resin and Sr Spec. resin, electrodeposition and counting by alpha spectrometry and beta scintillation counter.

Especially the procedure simply combined two separate procedures for Pu isotopes and ^{90}Sr into one simple method using tandem column anion exchange resin as well as Sr Spec. resin. The sample solutions contained Pu and Sr isotopes were passed through upper part of the anion exchange column and then were passed the lower part of the Sr Spec column.
Pu isotopes were captured by the anion exchange column and the ^{90}Sr isotope was captured by the Sr Spec column with eliminating other interfering elements.

Reproducibility test as well as the chemical recovery using standard reference materials showed the very reliable results for seafood samples.

Using new radioanalytical method, the activity concentrations of the artificial radioactive nuclides were evaluated in seafood samples. Pu isotopes and ^{90}Sr were reported to be less than minimum detectable activity.

The chemical recoveries of Sr isotope by applied methodology are in the range of 47 - 90% and the Pu recoveries are in the range of 51 - 90%. Pu isotopes exists in seaweed is thought to be that the concentration of the environmental levels rather than the impact of the recent Fukushima Daiichi Nuclear Power Plant (FDNPP) accident.

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PT-199 [일반]

Simultaneous quantitative and qualitative analysis of Mono-, Di- and Tri-saccharides using ^{13}C Q-NMR in standardless conditions

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A saccharide is one of representative biomaterials that has important roles in living organisms such as storing energy and composing RNA. In this study, ^{13}C Q-NMR was adopted for qualitative and quantitative analyses of saccharides, which has an advantage of the wide ranges of chemical shifts without proton decoupling. A seven-mono-saccharide mixture and an eight-saccharide-derivative mixture (including di- and tri-saccharides) were analyzed by the inverse gated decoupling method of ^{13}C Q-NMR with maleic acid used as an internal standard. Experimental conditions including delay relaxation and acquisition time were fully optimized to obtain good S/N ratio. To validate ^{13}C Q-NMR method for the saccharide analyses, precision, intermediate precision, linearity, robustness and stability were carried out. In conclusion, ^{13}C Q-NMR method was successfully validated and applied for the determination of saccharide contents qualitatively and quantitatively in standardless conditions.

PT-200 [일반]

Evaluation of process blank in chemical separation for analysis of individual uranium particle by MC-ICP-MS

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In environmental sample analysis, the particle analysis focuses on the uranium isotopic ratio of individual micrometer-sized particles. In general, fission track-thermal ionization mass spectrometry (FT-TIMS) and secondary ion mass spectrometry (SIMS) have been used for particle analysis. In this study we used MC-ICP-MS which is used for bulk analysis in our laboratory as an alternative method for particle analysis. In order to use this instrument, particles containing uranium and/or plutonium should be dissolved and have been analyzed by chemical separation. However it is challenging to obtain reliable isotopic ratio and determine quantities due to a large amount of uranium background contained chemical experimental procedures. In our routine bulk analysis, the uranium backgrounds are around 15-20 pg. These values are too high to obtain reliable results of the isotopic ratios since the amount of uranium is around 5 pg in 1μm size of particle which is our target size of uranium particle analysis using MC-ICP-MS.

In this study, several efforts were performed for reducing the uranium backgrounds, the chemical separation steps were simplified and the bed volume of UTEVA resin and the elution volume were reduced. After then, the uranium backgrounds were systematically evaluated. The results of this experiment will be presented in the poster.

PT-201 [일반]

Determination of ^{143}Nd/^{144}Nd isotope ratio in environmental Samples by MC-ICP-MS

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A number of nuclear forensic methods have been developed to identify the origin of radioactive substance intercepted from illicit trafficking. Among them, isotopic ratio analysis of ^{143}Nd/^{144}Nd can provide information about where uranium ore concentrates (UOC) might be collected. The ^{143}Nd/^{144}Nd varies in nature due to the presence of the long-lived parent nuclide ^{147}Sm ($t_{1/2}$ = 1.06 x 10^{11} years), which changes to ^{143}Nd through alpha decays. In addition, the ratio of ^{143}Nd/^{144}Nd can be used to signature of the location of UOC. Since the distribution of ^{143}Nd can be different depending on the region and the type of rock.

For the measurement of ^{143}Nd/^{144}Nd ratio in environmental samples, effective chemical separation procedures are required prior to isotopic analyses by mass spectrometry. In this study, sample solutions of two standard soil samples and three rock samples were prepared by total dissolution method and were separated by using two steps. In first step, lanthanides which include Nd were separated from the major matrix. In second step, isobaric interfering elements such as Sm were removed. After separation, the concentration of Nd and Sm was measured by using multi-channel ICP-MS (Spectro), and the isotope ratio of ^{143}Nd/^{144}Nd was estimated by using MC-ICP-MS. The measurement precision of ^{143}Nd/^{144}Nd was less than 0.5% at the concentration of 1 ng/mL of Nd standard solution. The precise measurement of ^{143}Nd/^{144}Nd ratio in the sample, which was carried out in this study, could be applicable of nuclear forensic technique that can reveal the regional relation of the UOC.

PT-202 [일반]

Observation of sn-interferences on the uranium isotope analysis using secondary ion mass spectrometry (SIMS)

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The determination of isotopic ratios of uranium particles contained in environmental samples is important because the isotopic ratios provide the information to detect undeclared nuclear activities. Secondary Ion Mass Spectrometry (SIMS) is typically used to characterize the isotope composition of individual uranium particles, because it can locate uranium particles among others and provide the isotope data with high precision and accuracy within a short time frame. However, a main limitation of SIMS technique is molecular isobaric interferences which have similar masses as uranium isotopes. The molecular isobaric interferences are induced by some metal elements such as Sn, Pb, Mo, W, and Ba. For example, tin has 10 isotopes (^{112}Sn, ^{114} Sn, ^{115} Sn, ^{116} Sn, ^{117} Sn, ^{118} Sn, ^{119} Sn, ^{120} Sn, ^{122} Sn, ^{124}Sn), and the tin isotopes produce the polyatomic species such as ^{112}Sn^{122}Sn, ^{115}Sn^{120}Sn, ^{112}Sn^{124}Sn, ^{114}Sn^{124}Sn, and ^{115}Sn^{124}Sn. These species are possible to interfere with uranium isotopes (^{234}U, ^{235}U, ^{236}U, ^{238}U), and uranium hydride (^{238}U^{1}H), respectively. These interferences often result in the reduction of the accuracy and precision of isotope measurement.

In this study, we tried to evaluate the molecular isobaric interference levels induced by tin and confirm which uranium isotope is mostly influenced by the interferences. We prepared the simulated samples using standard uranium and tin solutions. First, we analyzed the tin solution using time-of-flight to observe the molecular isobars pattern in uranium mass range. Then, we evaluated the formation rates of molecular isobars using sector-field SIMS. Lastly, the interference levels induced by tin were confirmed by measuring the uranium isotope ratios of uranium-tin mixed sample. The detailed results will be presented in poster.

PT-203 [일반]

A study on the determination of hydrocarbon dew point of natural gas

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Hydrocarbon dew point(HCDP), one of the major quality factor of natural gas, is associated with hydrocarbon condensation, which occurs with decreasing pressure and/or temperature during long distance transmission and storage/processing processes. Build up of procedures for obtaining accurate HCDP is essential for gas transmission companies, because hydrocarbon condensation present may cause serious operational safety problems, especially pipeline natural gas containing heavier hydrocarbon components over C6+.

Technologies used in natural gas industries to determine HCDP are two different methods. The first is a manual or automatic device designed specifically to measure HCDP directly. The second is a method of indirect HCDP determination, which combines analysis of gas composition using the gas chromatograph and calculation based on the equation of state.

In this study, the two methods were described in detail and compared with the advantages and disadvantages. The automatic hydrocarbon dew point meter was installed to measure HCDP where natural gas was supplied with heavy hydrocarbon components under the actual field conditions.
In addition, measured HCDP has been compared with calculated HCDP, and confirmed that it was matched within the proper range.

PT-204 [일반]

A study on the establishment of the analytical technology for heavier hydrocarbons(C7+) in natural gas

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Introduction of various types of natural gas(for instance, Donghae-1 pipeline gas, SNG(Synthetic Natural Gas), etc.) to the Korea natural gas pipeline networks are gradually expanding, and they contain C6 and heavier hydrocarbon components unlike well-refined LNG(Liquefied Natural Gas).

The heavier hydrocarbons in natural gas are very important because it can cause the natural gas condensation and thus pipe damages. So it is necessary to establish accurate analytical techniques for heavier hydrocarbons in natural gas and to extend the scope of gas quality control.

In this study, the inter-laboratory test with KRISS, the national metrology institute of Korea, was conducted to confirm the accuracy and precision of analysis of the heavier hydrocarbons in natural gas. The test sample was Donghae-1 pipeline gas, sampled in a 10 L aluminum gas cylinder, and determined by GC-FID and the on-line gas analyzer with GC-TCD. The certified reference gas mixture for C1 ~ C10+ developed in KRISS was used as the standard gas, and the isomers of heavier hydrocarbons and unknown compounds were identified using GC-MS.

The results showed that the concentration of C6 in the sample was 0.1 % level and that of C7 ~ C10+ was total 0.03 % level, but there was a slight difference in the measured values depending on the type of equipment.

On the basis of these results, the performance verification test of the on-line gas analyzer installed on site using the same sample was additionally performed. As a result, it was confirmed that it was operating properly within the management level.

PT-205 [일반]

The screening and identification of melee size diamond using advanced methods

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Last year the synthetic melee diamond was disseminated throughout the Korean jewelry market. The melee diamond is generally called to very small diamond of weight under 0.25ct(diameter range is from 1.0mm to 4.1mm). The screening or identification of small sized diamond is very difficult and cumbersome due to individual analysis process. And it takes too much analysis time if the melee diamond sample is a large quantity. Moreover, if a lot of melee diamonds were set on the jewelry product as like ring, necklace, the analysis was impossible in the past.

For that reason, the Seoul Jewelry Industry Support Center introduced new system with advanced instruments. The new system using M-screen plus is adopted for automatic analysis of melee diamonds. From this system, we achieved the screening of melee diamonds more than 120,000pcs. In addition, we can easily detect synthetic melee diamonds set in the jewelry product using Gem Luminescence Imaging System.

Compared to early this year, the number of synthetic diamonds has decreased dramatically. As like this, the adopted new advanced methods has prevent indiscriminate inflow from foreign country to Korean diamond market and given much confidence to sales and distribution process of various companies that we support.

On the other hand, each analysis systems have a few limitations. Therefore, it needs complementary analysis process using the other instruments for improvement of accuracy.

In this study, we investigated more effective process for high speed and accurate identification results of diamond. The application of advanced methods will be a guide to identify of melee sized diamond in Korea market.

PT-206 [일반]

A study of the peel & shear strength on accelerated Weathering paints by SAICAS

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There are several ways to evaluate the durability on automotive coatings by measurement of hardness, adherence, gloss and color etc. However, it is difficult to study the characteristics of the paint interfaces due to a complex structure. To understand the adhesion characteristics in the interfaces, therefore, we measured peel and shear strength with the SAICAS (Surface And Interfacial Cutting Analysis System). The SAICAS is a specialized slop cutting technique for respective layer: it provides the peel & shear strength by using blade. In this study, we observed that the shear strength ranging from 1 to 3 ㎛ is markedly increased at surface of degraded samples after Weather-O-Meter (WOM) test (300 MJ/m^2). The shear strength of the weathering test specimen was more than two times higher than that of reference sample. To analysis surface hardness, pencil hardness test was additionally performed. We found that the surface layer under 3 ㎛ was reacted by sunlight, temperature, humidity and UV radiation source.

We are also investigating the interaction mechanism between pigments, resins, and additives at surface of deteriorated paint by comparing the functional group of accelerated weathering paints. The findings confirm SAICAS as an effective and promising tool to measure and analyze the interface within the multi-layer and durability properties of paint.

PT-207 [일반]

Structure and hydrogen bonding characterization of sag control agent (SCA) using NMR spectroscopy

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Sag control agents (SCA) is used to obtain glossy coatings with a high quality appearance in automotive paint and some general industry paint. SCA is consisting of polyester polyol and poly-urea. It is important to identify the structure of poly-urea molecule in SCA because this structure has an effect on the network structure in the paint as well as rheological behavior. We investigated the presence of urea group and side reaction products in the SCA using IR and NMR spectroscopy. Spectrum of IR and 1 dimensional NMR is so complicated to identify the detailed structures in SCA. We were able to distinguish between urea group and urethane group in the polymer mixture using multi-dimensional NMR spectroscopy. And weak hydrogen bond interaction between polyester polyol and poly-urea molecule is also analyzed. From the multi-dimensional NMR analysis, useful information may be obtained not only in the detailed structure of SCA but also in various complex polymer systems.

PT-208 [일반]

Structural analysis of the hair cosmetics on hair surface using x-ray photoelectron spectroscopy with gas cluster ion beam (GCIB) source

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Hair damage caused by various factors affects the characteristics of the hair. The development of effective hair cosmetic products relies on a detailed knowledge of the surface chemistry of the hair and the effect of the various ingredients (components) of the formulation on hair structure. The repairing effect of hair cosmetic products (conditioning agent) on damaged hair is considered to be due to adsorption on the hair surface and penetration into hair. However, the distribution and penetration of conditioning agent to the hair have not been adequately understood.

The Surface sensitivity and detailed chemical information available from X-ray Photoelectron Spectroscopy (XPS) and Time-Of-Flight Secondary Ion Mass Spectrometry (TOF-SIMS) are well known and are routinely applied to hair surface characterization. In order to investigate the interaction of the hair fiber surface with the hair cosmetic ingredients, we employed XPS equipped with Ar Gas Cluster Ion Beam (GCIB) Source. GCIB source overcomes limitations of Ar monoatomic ion source and enables depth profile analysis of organic materials without changing the chemical structure due to the surface damage.

In this study, the surface of hair samples treated with cosmetics containing natural oils and organic silicone were compared and analyzed. Natural oil components were only observed on the outermost surface of the hair, whereas organic silicone formed a relatively thick coating layer and penetrated into the hair.

The results of this study provide information that the composition of the hair conditioning agent affects the distribution and penetration on the hair surface.

PT-209 [일반]

A study of inorganic ion analysis in the organic matrix

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Many kinds of materials and chemicals are used in display manufacturing process, and products are completed through various manufacturing processes. The ion generated from the chemical solution and the material used during manufacturing process are one of important control factors. Because they cause various defects such as Image Sticking and Mura. Current carbon-containing organic ions are analyzed by Liquid, Gas Chromatography(LC, GC), and Inorganic ions are analyzed by Ion Chromatography(IC). In general, Ion Chromatography uses water as a solvent to detect inorganic ions, which limits the analysis of inorganic ions contained in organic materials. In order to solve this problem, Ion Chromatography with Chemical Suppressor and Matrix Elimination are used, and inorganic ions of ppb level are analyzed in organic materials

PT-210 [일반]

Contamination cleaning of TEM samples (Formvar Grid) with halogen lamp

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The analysis of scanning transmission electron microscopy data is often hampered by surface contamination during electron irradiation. The gradual build-up of carbon layers on the specimen will reduce the image contrast and increased the signal from C K-edge energy losses, thereby causing artefacts. Common cleaning methods such as heating, rinsing, vacuum heating and plasma etching all have limitations. In this experiment, additional method was carried out by halogen lamp irradiation with vacuum heating suitable for formvar grid and introduce a case of carbon contamination reduction in STEM.

PT-211 [일반]

Fragment analysis of triazine compound using mass spectrometer

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Organic compounds are basically composed of hydrocarbons and are substances that artificially create specific organic molecules through modification or generation of carbon atoms and existing bonds. Among the, triazine derivatives have antibacterial, antifungal and antiviral properties, which have been used in the cosmetics industry and have recently been used in the development and manufacture of new materials based on the electron transporting characteristics of the triazine structure. In this study, it was confirmed that the patterns of the triazine materials used in the multifaceted trials were compared with each other by using three mass spectrometers. It is applied to the qualitative analysis of the substance through the confirmation of fragment in the analysis of various organic compounds.

PT-212 [일반]

Analysis of organic multiple layers using GCIB ToF-SIMS

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ToF-SIMS (Time of Flight Secondary Ion Mass Spectrometry) has been widely used in the field of display and semiconductor that is needed to analyze depth profile of micro area due to high lateral and depth resolution. Especially, ToF-SIMS is very powerful to analyze chemical information and structure of internal layer and interface in multiple layer of display. In recent years, as display research and development using organic materials has been expanded, it has become very important to analyze soft organic layers without damage. Damage of organic materials can be minimized because GCIB (Gas Cluster Ion Beam) has sputtering the surface using cluster ion with low energy per atom. In this study, GCIB which is the most suitable for the analysis of the organic multiple layer depth profile and the analysis examples using it are introduced.

PT-213 [일반]

Effect of light on size of *chlorella sorokiniana* and production of glutathione using gravitational field-flow fractionation (GrFFF) and related techniques

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Chlorella sorokiniana (called '*chlorella*') is a single cell organism belonging to the green algae. It is a kind of plaque, and contains various types of nutrients such as protein, chlorophyll, vitamins and minerals, and is considered to be a food for the future [1].

Chlorella has size ranging 2 ~ 10 μm, and each divides into four new cells every 17 ~ 24 hours. Previous studies on chlorella have mainly focused on its applicability as a biofuel or an enzyme for plant metabolism. There has not yet been many reports on basic growth mechanism of *chlorella*.

The antioxidant-production capacity of the *chlorella* is affected by various parameters including pH, temperature, and the presence of light [2]

In this work, the change in the size of the *chlorella* with the presence of light was studied. Then the effects of the size, the presence of light, and incubation time on the capacity of the *chlorella* for production of glutathione were investigated. Size of *chlorella* was determined using an optical microscopy (OM) and gravitational field-flow fractionation (GrFFF). GrFFF is a gentle elution-based separation technique that is known to be useful for separation of micron-sized particles. The glutathione produced from chlorella was analyzed quantitatively using a UV/Vis spectrophotometry.

Both the size and number of *chlorella* increased with increasing incubation time until the incubation time of 96 hours, after which they remained unchanged. The concentration of glutathione was also increased with the incubation time until the incubation time of 96 hours, after which it was gradually decreased.

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PT-214 [일반]

Study on effect of composition of salt and temperature on oligomerization of glutamate decarboxylase using asymmetrical flow field-flow fractionation (AF4) and light scattering

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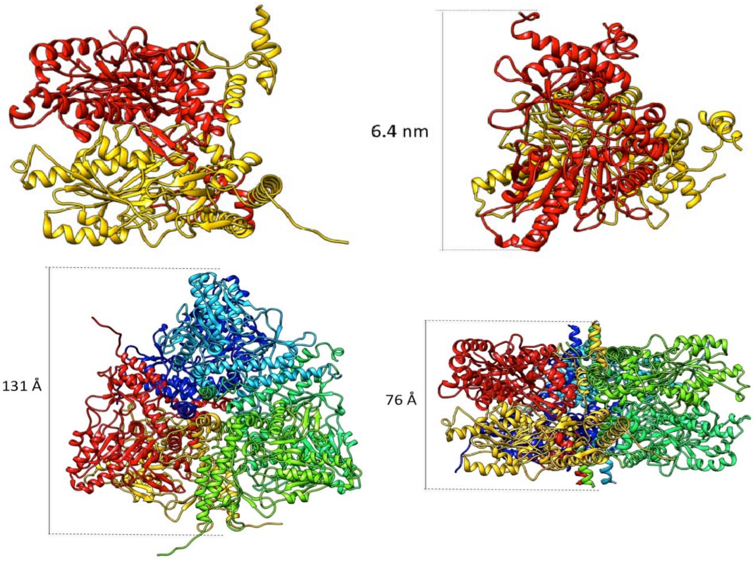
Glutamate decarboxylase (GAD) from *Lactobacillus brevis* (*L. brevis*) is an enzyme that catalyzes the decarboxylation reaction of glutamic acid yielding aminobutyric acid (GABA). GAD is present in living organisms, from bacteria to human. It has been reported that GABA lowers blood pressure in patients with mild hypertension and gives other potential benefits [1, 2]. It has also been reported that GAD from *L. brevis* (named ‘gadB’) reaches its highest level of activity when it is in the hexameric form [3, 4]. The oligomerization seems to play an important role in the gadB mechanism.

In this study, effects of pH, type and concentration of salt, and temperature on the oligomerization of gadB were investigated using asymmetrical flow field-flow fractionation (AF4) and light scattering techniques.

The hexamer content of gadB was 98%, and was most stable at pH 6. Also, the hexamer showed high thermal stability up to about 57 °C. And the hexameric form of gadB was found to be most stable with NaCl or KCl.



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PT-215 [일반]

Application of thermal field-flow fractionation coupled with multi-angle light scattering (ThFFF-MALS) and size-exclusion chromatography (SEC) for characterization of synthetic rubber (SR)

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Synthetic rubber (SR) usually contains microgel that has ultrahigh molecular weight. The presence of microgel provides additional aging stability and excellent resistances against wear or swelling. SR is widely used in various products such as hoses, shock mitigation material, rubber-covered roll, and the sole of a shoe, etc. Thermal field-flow fractionation (ThFFF) is a molecular weight (MW)-based separation tool that is useful for analysis of microgel-containing ultrahigh MW polymers. Unlike in size exclusion chromatography (SEC), the sample solution could be injected without pre-filtration. ThFFF is known to furnish higher resolution than SEC, especially for ultrahigh MW polymers [1]. Accurate analysis of MW, molecular weight distribution (MWD) and the gel content of rubber is vital as they affect physical, mechanical, and rheological properties of the final products such as viscosity, tear resistance, and the product stability, etc. For instance, a small difference in MW or in the size distribution may lead to a large or, at times, important differences in the performance of the products [1]. ThFFF coupled online with a multi-angle light scattering and a refractive index detector (ThFFF-MALS-dRI) allows determination of MW, MWD, and molecular size (root-mean-square) without a need for instrument calibration. The online coupling of MALS can also yield information such as the molecular conformation. ThFFF-MALS-dRI is necessary that find optimal condition to gain good separation. So experimental was changed. It was employed for physical characterization of SRs produced by different preconditioning processes. Each is showed different tendency. At the result of SEC and ThFFF-MALS are roughly similar to 7.8 × 104 and 4.9 × 104 about Mn value, but Mw and Mz values were 2.1 × 105 and 2.6 × 106 and 6.5 × 105 and 1.6 × 108, respectively. Results indicate ThFFF-MALS-RI is an effective tool for analysis of microgel-containing ultrahigh MW rubbers [2].

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PT-216 [일반]

Anion-exchange membrane with PVC-*g*-PBVBIC prepared by SARA-ATRP and their application as separator in vanadium redox flow battery

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Ion exchange membranes with the ability to exchange ions are one of the most efficient energy conversion devices in recent years. The representative vanadium redox flow battery (VRFB) has attracted attention as a promising energy storage system because of its high efficiency. The commonly used aqueous VRFB has a limited because of the low potential window of aqueous solvent, and it has the low stability because of damages effect due to strong acidic condition. In order to overcome such disadvantages, non-aqueous VRFB has been proposed, but commercial membranes have the disadvantage such as dissolving effect in an organic solvent and expensive manufacturing price. Therefore, it is urgent to develop a membrane which is inexpensive and does not dissolve in an organic solvent.

In this study, a non-aqueous VRFB membrane was prepared by crosslinking 1-butyl-3- (4-vinylbenzyl) imidazolium chloride on poly (vinyl chloride), named by PVC-*g*-PBVBIC, for use as a non-aqueous VRFB membrane. The ion exchange capacity, water absorption, swelling phenomena, ionic conductivity, and thermogravimetric analysis of the prepared anion exchange membranes were characterized in order to use VRFB separator. The battery tests of the organic VRFB with PVC-*g*-PBVIC membrane is in progress.

PT-217 [일반]

Preparation of anion-exchange membrane based on PS-*b*-PVEPI for vanadium redox flow battery

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Ion exchange membranes are being promoted as one of the most efficient energy conversion devices. Ion exchange membranes can be categorized as cation and anion exchange membranes, they have the property that can selectively exchange specific ions. Among energy storage systems, vanadium redox flow batteries (VRFB) is a promising electrochemical energy storage system for the electrical power generating systems. VRFB have attractive features such as high power density, various loading levels and considerable energy efficiency. Non-aqueous electrolytes enable cell operation at higher potential window compared to aqueous electrolytes, thus it result in higher energy density and energy efficiency. In this study, we synthesized the anion exchange membranes by blocking 4-vinylethylpyridinium iodide onto poly styrene (PS) using the ARGET-ATRP method. The synthesis of anion exchange membranes was evaluated via 1H-NMR, FT-IR, ionic conductivity, ion-exchange capacity, water uptake, swelling ratio and thermal properties. Furthermore, the vanadium (IV) ion permeability was also measured to confirm its usability as a membrane of VRFB system. The charge/discharge test of the VRRF with the synthesized anion-exchange membrane is progress.

PT-218 [일반]

Determination of Na^+ and K^+ cation in human urine by QCM ionic sensor

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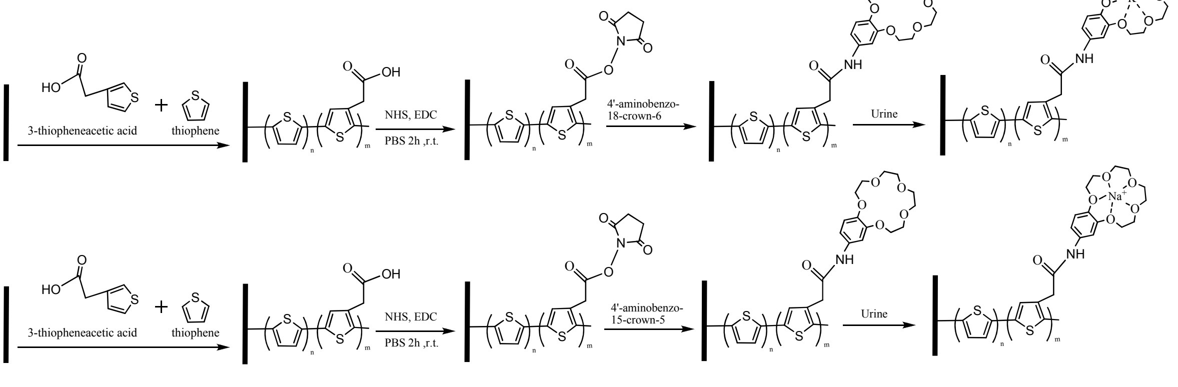
Because of the busy life these days, many people consume a lot of fast food for a meal. Fast food is often used because of its taste and the fact that it is produced quickly. However, this fast food causes not only nutritional imbalance, but also high salt content, which makes people over-intake of sodium. Over-intake or sodium can cause problems with hypertension, stroke, coronary artery disease, cardiovascular disease, and the risk of kidney disease, stomach cancer, and osteoporosis. On the other hand, the large amounts of potassium intake have been reported to lower blood pressure, to regulate pH in the body, and to prevent osteoporosis and renal stone. Therefore, the sensing of the sodium and potassium concentration in human urine is very important factor at aspect of a healthy life. However, the 24-hour method, which is the standard test for determining sodium and potassium concentration, is difficult to collect urine, and the random urine analysis method is difficult to evaluate daily sodium intake. Thus, many chemical luminescence sodium/potassium sensors have been developed. However, these sensors were less sensitive to quantitative measurement of the amount of sodium and potassium by chemical luminescence methods and lacked accuracy.

Consequently, we developed ionic QCM sensors, which could be directly determined Na^+ and K^+ in human urine in this study. First, carboxylic group was introduced onto the QCM electrode surface by electrochemical copolymerization of the mixture of thiophene and 3-thiopheneacetic acid, and we introduced crown ether as ionic selector onto the carboxylic group modified QCM electrode through amide bond reaction. The surface of the developed sensor was characterized via contact angle, cyclic voltammetry, FT-IR spectroscopy SEM and EDS in order to confirm successfully preparation of ionic QCM sensor. The prepared QCM ionic sensor with [18]crown-C6 adsorbed K^+ and the sensor with [15]crown-C5 adsorbed Na^+ in this study. From the results of this study, we think that the prepared QCM ionic sensor could be used as a sensor for fast and accurate measurement of sodium and potassium concentrations in human urine.



PT-219 [일반]

Development of CdSe sensitized solar cell using the polyphenylene and polythiophene conducting polymer as electron transfer mediator

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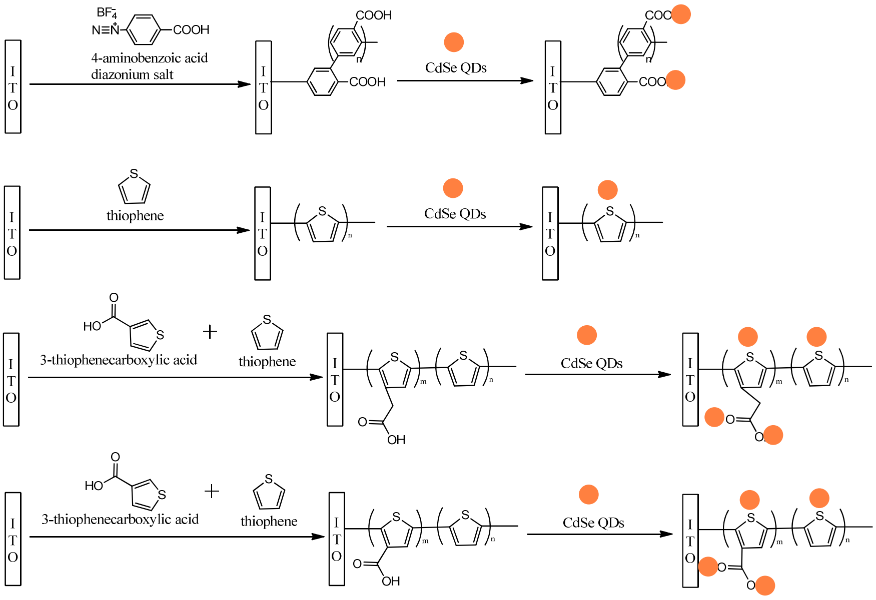
Solar cells using solar energy have attracted much interest because they have the advantage of being able to make an infinite resource, a large area, and mass production. However, the quantum dot-sensitized solar cell has a little disadvantage in that the production cost is low, the recovery period of the energy used in manufacturing is short, the production process is simple but the efficiency is low. In order to overcome the above mention disadvantage, many researchers are studying for preparation of electron transfer mediators such as metal oxide semiconductor. However, a little has been reported about the preparation of the conducting polymer as electron transfer mediator.

In this study, the conjugated thiophene and phenylene polymers as electron transfer mediator were grafted on the ITO electrode by electrochemical polymerization. After then, the photoanode was prepared by supporting TGA-capped CdSe QDs on the polymer electrode. The synthesized photoanode was characterized by UV, PL, IR and contact angle. The photoanode was used to fabricate a solar cell unit, and the efficiency of the photovoltaic cell was measured using a simulator and compared with the efficiency of the TiO_2-coated electrode. As a result, the solar cell with conducting polymers have a good solar efficiency.



PT-220 [일반]

Preparation and evaluation of enzymatic biosensor with polythiophene conducting polymers as electron-transfer layer

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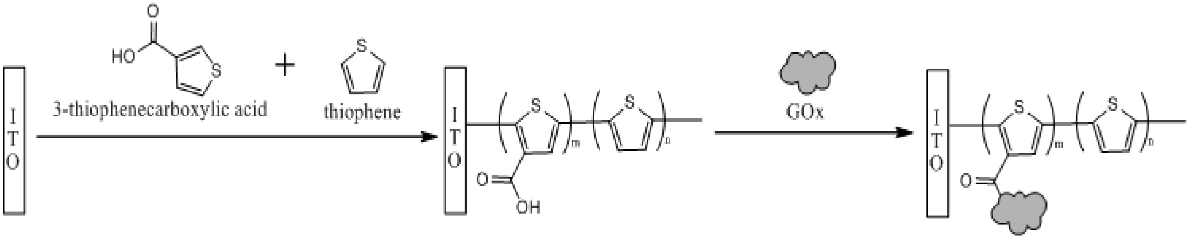
Diabetes is a disease caused by deficiency of insulin secretion or dysfunction necessary to control blood sugar. If the high blood sugar level persists for a long time, complications will occur and life is dangerous. In order to treat diabetes, it is important to manage blood sugar through healthy lifestyle and drug therapy, and to prevent complications through routine care and continuous follow-up. The principle of the glucose sensor is that glucose reacts with glucose oxidase to produce gluconolactone and H_2O_2. At this time, the produced H_2O_2 is quantified.

In order to prepare high sensitivity glucose sensor, we grafted various thiophene polymers, which is used as an electron transfer layer on the ITO glass surface. The grafted thiophene polymers have an excellent conductivity and improves the introduction amounts of enzyme because of carboxylic acid group (-COOH). The –COOH group may be used as binding site between enzyme and the electron-transfer mediator. We also confirmed the successful preparation of the conductive polymer electrode and the enzyme electrode through IR, SEM, and contact angle characterization. Sensing range, limit, response time, and stability of the enzymatic biosensors were evaluated through Cyclic Voltammetry (CV). As a results, the enzymatic biosensor prepared by polythiophene conducting polymers was confirmed the determination of the wide range of concentration. In conclusion, the biosensors prepared by polythiophene conducting polymers are expected to be suitable for measuring blood glucose.



PT-221 [일반]

A fluorescence study of flip-flop rate of lipid molecules in lipid vesicles

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We conducted the fluorescence experiment for studying the membrane properties by using lipid vesicles as a model membrane. Two kinds of the large unilamellar vesicles (LUVs) were prepared for investigating the contribution of hydrophobic interaction between lipids to the total intermolecular interaction. One was made of 1,2-Dimyristoyl-*sn*-glycero-3-phosphocholine (DMPC). the other one was made of DMPC and 1,2-dihexanoyl-*sn*-glycero-3-phosphocholine (DHPC). in order to minimize the size effect of LUV on the intermolecular interaction between lipids in vesicular surface, two kinds of LUVs with the same size were prepared and their sizes were determined by a dynamic light scattering (DLS) instrument.

Flip-flop rates of lipid molecule in two kinds of vesicles were measured and compared by using the fluorescence spectroscopy. in this study 1,2-dimyristoyl-sn-glycero-3-phosphoethanolamine-N-(7-nitro-2-1,3-benzoxadiazol-4-yl (NBD-PE) ammonium salt was used as a fluorescence probe molecule.

the measured flip-flop rate of NBD-PE in DMPC vesicle was smaller than that in [DMPC+DHPC] vesicle. this difference seemed to be resulted from the difference of the hydrophobic interactions between NBD-PE and DMPC or DHPC.

from the flip-flop rates measured at some temperature range the activation energies of flip-flop of NBD-PE in the DMPC and [DMPC+DHPC] cases were determined.

PT-222 [일반]

The Development of SBVI polymer-conjugated siRNA Delivery System

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RNAi (RNA interference) treatment has recently become popular in gene cause disease. It is representative that using chemically synthesized siRNA is delivered into cells to artificially cut and degrade specific mRNA to block the expression of the gene causes disease. siRNA will play an important role as a therapeutic agent, but it also has limitations in that active absorption in cells is difficult. Therefore, research on how to deliver has been going on continuously in order to overcome these.

In this study, siRNA was conjugated with a polymer called SBVI and this conjugate was studied to maximize intracellular delivery efficiency. PEG (poly ethylene glycol), which has been widely used as a drug delivery polymer, is easily oxidized. And its efficacy and long-term stability are deteriorated. Also, MPC (2-methacrylolosyethylphosphorylcholine), one of the main delivery material, has a disadvantage that it is difficult to synthesize.

On the other hand, polymers coated with Zwitterion such as poly sulfobetaine methacrylate (pSBMA) are relatively easy to synthesize and strongly inhibit non-specific protein adsorption even in serum. It also has the property of inhibiting the prolonged bacterial propagation for up to 10 days at room temperature.

SBVI is the abbreviation of Sulfobetaine vinylimidazole, which acts as a Zwitterion. SBVI has been shown to improve the siRNA delivery efficiency by replacing the methacrylate backbone of SBMA with vinylimidazole, which is also relatively easy to synthesize.

In this study, we will develop a method to maximize the delivery efficiency of siRNA with SBVI transporter. And also, we will investigate how much it has low protein adsorption and how it behaves in cells.

PT-223 [일반]

Changes in shape and stability of liposomes with changes in osmotic pressure

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Liposome is an amphipathic substance with both hydrophobic and hydrophilic properties. In addition, it has low toxicity, high stability and solubility because it has lipid bilayer structure similar to biomembrane. In particular, the stability and shape of the liposome is the most important factor when used as a drug delivery system. The liposome used as a drug delivery vehicle should be capable of delivering therapeutic agents by transporting the drug to the target site without leakage and loss.

The effect of osmotic pressure when liposomes are used in vivo affects the shape of the liposome, such as shrinkage or expansion, which can affect stability. This change in the shape of the liposome greatly increases the likelihood of the drug leaking out of the liposome, rendering it unable to perform its role as a drug carrier.

In this study, we measured the size and stability of liposomes using AsFIFFF and DLS, and Zeta-potential, and measured liposome size and shape changes under osmotic pressures. As the higher the lipid concentration was and the lower the storage temperature was, the more the size was stable. Experiments under various osmotic conditions showed that the mean size of hypotonic solution was larger than that of isotonic one, but that of hypertonic condition was larger than that of isotonic one. Based on the above results, in order to test the effect of each osmotic pressure on the drug delivery, a fluorescent substance was added to the liposome and transferred to the model cell under three osmotic conditions to measure the efficiency of the fluorescent substance inside of vesicle.

In conclusion, the stability of liposome and the efficiency of liposome release under osmotic pressure conditions were investigated, and it is expected that optimal conditions of liposome production can be suggested when it is used as a drug delivery system.

PT-224 [일반]

Development of the detection of microorganism from the natural dye materials

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Artificial dye agents contain various harmful substances, which can cause various adverse effects such as allergic contact dermatitis, scalp disease, and hair loss. Therefore natural dye agents are more widely used than artificial pigmented ones. Among many natural pigments, loson which is an ingredient of henna is combined well with the keratin, the components of hair, and has been known to show a good dyeing effect. Therefore, henna has been widely used as a natural dye agent.

Microorganism are known to be harmful to material by their by-product. Therefore, Ministry of Food and Drug Safety (MFDS) has established a standard of microorganisms that should not be present in products. It's standard includes the measurement of the number of P.aeruginosa, E. coli, and Staphylococcus aureus and the number of aerobic live bacteria (bacteria and fungi). Officially, it is possible to determine the presence of microorganisms by culturing for 3 days by the microorganism detection method set by MFDS. The method of detecting the microorganism in MFDS can be accurately confirmed, however, the longer detection time leads us to develop molecular biological method for the quick determination of the number of microorganisms.

Molecular biological method can be cross-checked with the method of MFDS, and among the methods of molecular biology, we will adopt fluorescence detection method using RT-PCR. The method is to identify the increase in the number of microorganisms by attaching a fluorescent substance to the microorganism.

If this method is introduced in the market, it is possible to test the safety of the natural dye agent about the microorganism more quickly, and there is a possibility that it can be adopted in the future in MFDS, and it is helpful to the experiment to increase the expiration date by removing microorganisms in the product.

PT-225 [일반]

Development of target-specific cell imaging probe using fluorescent nanoparticle coated with serum proteins and conjugated with antibody

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Development of targeted-oriented fluorescence cell imaging probe is of very importance in visualizing for dynamic studyof membrane proteinsand target-specific drugdelivery. Quantum dot, the representative fluorescence nanoparticle (NP),has been utilized as a good candidate for this study due to its high photostabilityand brightness for long-term tracking of targeted proteins.However,toxicity of cadmium and low colloidal stability in physiological conditionhavelimited its usage in biomedical fields.

Therefore, we have developed heavy metal-freeZAIS[$(Zn_xAg_yIn_z)S_2$] nanoparticle and increased itsphysiological stability via surface modification using serum proteins. It was prepared via the sonochemicalapproach because of its short reaction time and facile purification procedure.Following the exchange of dodecylamine on the surface of ZAIS NPfor hydrophilic mercaptopropionic acid (MPA), bovine serum albumin (BSA) werefurther passivated.

Besides, we attached to BSA-coated ZAIS NPs Herceptin whichis therapeutic antibody for Her-2 receptor on breast cancer cell, and assessed their targeting efficiency using Her-2 overexpressed breast cancer line(SK-BR-3) and their biological application.

We further characterized protein coated ZAIS nanoparticles for the size variation, stability in physiological solution, and resistance against non-specific attachment by random proteins in culture media by using gel electrophoresis, DLS, zeta potential, TEM.

As a result, this approach will be utilized for the development of the targeted imaging probe for cancer cells, and supplythe optimum platform for the fluorescence nanoparticle-based target-specific imaging with high stability for the real-time cell imaging and in vivo imaging.

PT-226 [일반]

The synthesis of high performance non-toxic $(Zn_xAg_yIn_z)S_2$ nanocrystal using ultrasonication

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Quantum dot, a semiconductor nanocrystal that exhibits good fluorescence properties, is being applied to a variety of fields, including optical equipments, sensors, and photovoltaic cells. Quantum dot's brightness and stability, and emission wavelength determined by particle size, have led to research for bio-imaging applications. However, such applications have been limited due to toxic heavy metals such as cadmium, selenium and tellurium in Quantum Dot. To solve these problems, fluorescent nanoparticles that do not contain specific heavy metals and have low toxicity such as InP, InP / ZnS, $CuInS_2$, $AgInS_2$, and ZnS-$AgInS_2$ (ZAIS) have been studied. We have synthesized $(Zn_xAg_yIn_z)S_2$, which is low in toxicity and has various emission color profiles according to the ratio of Zn, In and Ag. In this experiment, ZAIS nanocrystals were synthesized by using ultrasonication in order to perform faster and more accurate synthesis than the conventional synthetic methods.

In order to obtain high performance fluorescence properties, ZAIS fluorescence nanoparticles were synthesized by controlling factors such as temperature, pressure, and time of ultrasonication in the nanoparticle synthesis process, thereby tracking the change in the emission mechanism of ZAIS fluorescent nanoparticles .

PT-227 [일반]

Study of oxidation stability enhancement of natural dye henna

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Currently, artificial dyes p-phenylenediamine, enhancing for the dyeing effect. However, this substance may cause adverse effects on the human body such as skin allergies and acute urticaria. Therefore, there is an effort to replace the artificial dye with a natural dye. Henna, a natural dye, is attracting much attention because it has various effects such as liver detoxification function, antioxidant activity and anti-inflammatory effect.
Henna keeps the scalp healthy for the worries of modern people these days. Lawson, main component of henna, has capability to dye white hair. However, Lawson is a main problem for losing the effect of dye as the oxidation progresses. The oxidation stability is a significant material to keep the effect of natural henna dye.

In this study, we used natural antioxidants such as Natrodix, Vitamin E and natural herbal preservatives. Natrodix , a non-irritating multi-plant extract made from green tea, chamomile, magnolia and willow, it has various advantages such as anti-aging and moisturizing effect. Vitamin E is well known for soothing the skin moisturizing and anti-aging. Natural oriental herb preservative is antioxidant having anti-aging, anti-inflammation effect. these three natural antioxidants, natrodix, vitamin E, herbal preservatives will be improve for the oxidation stability of henna dyeing.

PT-228 [일반]

Study of cellular behaviors on hydrophobic PDMS (poly dimethylsiloxane) nano-brush by tracking FA complexes using BSA-coated ZAIS nanoparticle probe

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ZAIS nanoparticle (NP) is a fluorescence emitting NP having a composition x+y+z = 1 of zinc-silver-indium-sulfide ($(Zn_xAg_yIn_z)S_2$). ZAIS NPs do not use heavy metal elements and have the advantage of fluorescence without toxicity. In addition, BSA-coated ZAIS nanoparticles prevent aggregation with other proteins due to intrinsic property of BSA protein. The polymer brush, covalently coated scaffolds using polymers, can not only utilize their various properties such as the control of surface coating density, structural change according to temperature, and additional attachment of biomaterials, but also mimic microenvironments similar to its extracellular matrix (ECM). These potentials lead the polymer brush to attract special attention in the field of regenerative medicine, stem cell biology, and tissue engineering.

We cultured HeLa cells on both hydrophobic bulk PDMS (poly dimethylsiloxane) and PDMS nano-brush (~ 3.9 nm depth) on the glass scaffold to compare cellular behaviors on different substrates. In order to elucidate the diffrence of morphogenesis, we tracked FA complexes with BSA-coated fluorescent ZAIS and also confirmed changes in Hela cell behavior along each substrate. Interestingly, results showed dramatic discrepancy in cell attachment, spreading, and population, of which PDMS nano-brush resulted almost the same as those of glass in spite of its high hydrophobicity.

Based on the observations, we proposed that focal adhesion (FA) complexes of Hela cells discover and interact with specific hydrophilic spots from the glass scaffold among highly hydrophobic PDMS nano-brushes within the range of ten nanometer depth.

PT-229 [일반]

Supersensitive plasmonic single nanoparticle-based cancer antigen 125 immunodetection by dual-mode wavelength-dependent enhanced dark-field microscopy

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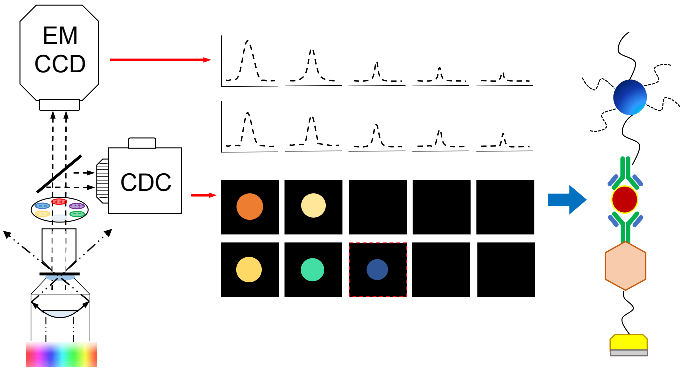
A supersensitive immunodetection was achieved for the biomarker cancer antigen 125 (CA125), which was developed based on characterization of single-particle plasmonic scattering by dual-mode wavelength-dependent enhanced dark-field microscopy (EDFM-DM). For simultaneous dual-detection, an electron multiplying cooled charge-coupled device camera and color digital camera were used for qualitative and quantitative analysis, respectively, based on the dark-field scattering images. To choose of optimum fluorescence-free tag, various size of different plasmon nanoparticles (i.e., gold nanoparticles, 5 nm, 12 nm, 20 nm, 100 nm and 250 nm; silver nanoparticles, 20 nm, 30 nm, 40 nm, 80 nm and 100 nm) were used as the detection tags and investigated with wavelength dependence of the quantum efficiency of the electron-multiplying charge-coupled device camera, and the light source, the 40-nm silver nanoparticle (AgNP) was selected as an optimum fluorescence-free tag. CA125 ovarian cancer antigen was screened at single-molecule level and quantitatively analyzed by measuring the scattering signals of 40-nm AgNP on gold-nanodots arraychip with lowest possible LOD (4 μU/mL, $S/N = 3$) with a wide dynamic detection range of 4 μU/mL-80 U/mL ($R = 0.9935$), which was a 100-375,000-fold lower detection limit with a 100-100,000-fold wider dynamic range than previous detection methods. In addition, recovery was greater than 98% with the spiking of standard CA125 in human serum samples. Dual-mode EDFM-DM based optical property of the plasmon nanoparticle allowed us for a sensitive detection of disease related biomolecules at single-molecule level.



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PT-230 ［일반］

Simultaneous detection of thyroid hormones by immunoreaction-based dual-wavelength capillary electrophoresis

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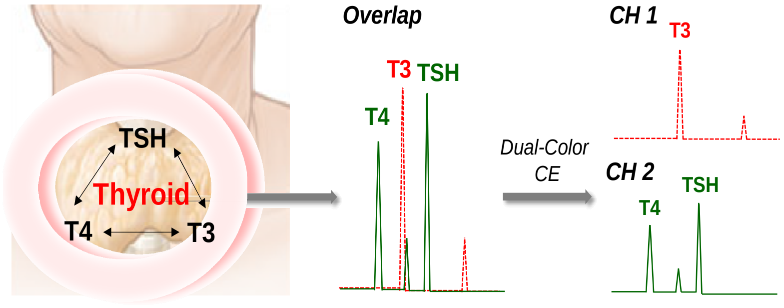
A novel dual-wavelength capillary electrophoresis (CE) with laser-induced fluorescence (LIF) detection has been investigated for the simultaneous separation and determination of thyroid stimulating hormone (TSH), thyroxine (T4), and triiodothyronine (T3). Thyroid hormones have been reported to influence various diseases such as thyroidectomy, thyroiditis, and hypothyroid [1]. Thus, measurements of T4, T3, and TSH are helpful for the clinical evaluation of thyroid function [2]. In this study, combined method of immunoreactions-based CE and biotin-streptavidin interaction was developed for highly selective detection of thyroid hormones as a function of separation efficiency and migration time. Various factors such as running buffer pH, separation voltage and effective length were also examined in order to determine the optimum CE conditions. All three of standard thyroid hormones were analyzed within 3.2 min in 25 mM $Na_2B_4O_7$-NaOH buffer (pH 9.3) without losing resolving power under optimal conditions, which were 1,000-100,000 times more sensitive than other previous detection methods. Moreover, the LIF detection also successfully applied to the analysis of real human blood samples. As a result, the immunoreaction-based CE method with LIF detection is an effective, rapid analysis technique for highly sensitive detection of thyroid hormones related to thyroid gland disease [3].



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PT-231 [일반]

Quantitation analysis of selenium metabolites in sample in vivo by HPLC-inductively coupled Plasma-MS

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After combining High Performance Liquid Chromatography and Inductively Coupled Plasma Mass Spectrometry, Post Column Isotope Dilution (PCID) can be used to more precisely and accurately quantify selenium, which exists as trace element in the human body [1]. In our previous studies, H_2 was used as a collision / reaction gas to remove spectroscopic interference in selenium analysis in human blood. However, when H_2 is used as the collision / reaction gas, $^{80}BrH^+$ and $^{82}BrH^+$ matrix is generated, which cause the isobaric interference to the selenium signal and give errors for accurate quantification. Hence we changed the collision / reaction gas to deuterium, and spectroscopic interference of BrH^+ was eliminated effectively [1]. Also selenium in sample in vivo exists in various forms such as selenoprotein, seleno amino acid, and inorganic selenium. Qualitative and quantitative analysis of selenium is very important when examining the effect of selenium on human body. Therefore, selenium in various sample in vivo such as fingernail, toenail, hair, urine and exhaled breath were separated and analyzed. The nail, toenail and hair were analyzed by HPLC-ICPMS after pre-treatment of optimal condition. It is known that volatile dimethylselenide is the main chemical species in the respiratory selenium compounds and using GC-MS is common to analyze these VOC [2]. but In this study, exhaled breath was collected by a Tedlar bag and dissolved in a solvent and analyzed by HPLC-ICPMS.

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PT-232 [일반]

Separation and analysis of Se species from various human samples using HPLC-ICPMS

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Since selenium(Se) exists in the body in trace amounts, ICP/MS is used for accurate analysis. Hydrogen(H_2) is mainly used as the collision/reaction gas, but it reacts with Br which exists in a large amount in the human sample to generate $^{1}H^{79}Br^{+}$, $^{1}H^{81}Br^{+}$. Since this acts as a major interference factor for the *m/z* 80, 82 signal, previous studies in this laboratory have removed the Br interference using deuterium(D_2) as the collision/reaction gas, and the isotope dilution method using $^{78}Se/^{80}Se$ We have established a method to accurately and precisely analyze Se of human serum.

The concentration of Se in the body is measured mainly in biological samples such as blood, urine, fingernails, toenails, hair, and exhaled breath. The boundaries between the essential and toxic levels of Se are very narrow and the consumed Se is present in various chemical forms throughout the body through metabolic processes. Therefore, the method of analysis should be used in detail and differently depending on the type of biological sample to be analyzed and the chemical form of the analyte.

Dimethylselenide(DMSe), Trimethylselenium(TMSe) excreted in the urine are volatile Se compounds, and the organic and inorganic Se compounds released into the urine depend on the chemical form of Se that is ingested. Se of fingernails, toenails and hair reflect long-term Se exposure. Human serum Selenoprotein was separated and analyzed by HPLC-ICPMS using the Post-Column Isotope Dilution (PCID) method. Based on this, various kinds of Se compounds in the body were pretreated by dissolving, extracting and enzymatic separation according to their chemical characteristics, and analyzed by HPLC-ICP / MS and PCID.

PT-233 [일반]

Synthesis and characterization of zinc ion imprinted polymer

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This study is to synthesize and characterize the materials for making chemical sensors, which can selectively detect Zn, which is known to be associated with Alzheimer's disease. Both patients and the health care system may need a simple and fast screening the disease diagnosed by detecting Zn. In order to detect Zn selectively and sensitively, Zn ion imprinted polymer (ZIIP) containing Zn ion and Non-ZIIP (NZIIP) not including Zn ion were synthesized by bulk polymerization and investigated. Zinc nitrate used as a template was dissolved in acetonitrile. And a monomer, a cross-linker, and an initiator were sequentially added to the previous solution. Then, it was placed at 100℃ for 35 min for polymerization resulting in ZIIP. NZIIP was synthesized in the same condition as ZIIP synthesis but not adding zinc nitrate as a template. After polymerization, ZIIP and NZIIP were washed with acetic acid:methanol for template removal. The removal rate was confirmed by UV-Visible spectrophotometry using an indicator. Functional groups of ZIIP and NZIIP after polymerization were identified by Fourier Transform Infrared Spectrometer, respectively. Optimized Solid solution ratio and carried out isotherm test. Through isotherm model, maximum sorption capacity and sorption features of ZIIP compared to NZIIP was figured out. Selectivity tests with Ag^{2+}, Cu^{2+}, Co^{2+} and Pb^{2+} will be progressed.

Keywords: Zn Ion imprinted polymer, Adsorbent, Polymerization, Isotherm model, Selectivity test

PT-234 [일반]

A study on activated magnetic hydrochar from coffee sludge as a selective adsorbent for 2,4-Dichlorophenoxyacetic acid

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Hydrothermal carbonization (HTC) has been utilized to convert wet biomass to useful product such as hydrochar without preheating. Among various features of hydrochar, it can be used as an adsorbent to extract heavy metals, organic compounds, and many others from different matrices. In this study, magnetic hydrochar was generated from coffee sludge to investigate the sorption capacity of 2,4-dichlorophenoxyacetic acid, which is sued as the 3rd most powerful herbicide in the world. The effect of magnetization of hydrochar was evaluated by characterization of magnetic hydrochar and sorption behavior. Previously, HTC reaction condition for coffee sludge was optimized at 230℃ for 4 hours. It was determined by surface area and pore volume calculated by methylene blue number and iodine number. After converting coffee sludge to hydrochar, the activated magnetic hydrochar was generated and tested for magnetic susceptibility. Three different activation temperatures were tested at 500°C, 600°C, and 700°C. The activated magnetic hydrochar maintained the sorption capacity regardless of activation temperature with solid to solution ratio of 1: 750. Finally, sorption tests were conducted on coffee sludge as biomass, hydrochar, and activated magnetic hydrochar and sorption amount was measured by UV-visible spectrometer. Sorption on activated magnetic hydrochar was about 1.5 times higher than that on the others at the concentrations we have tested.

Keywords: Activated magnetic hydrochar; Hydrothermal carbonization; Coffee sludge; Sorption; 2,4-Dichlorophenoxyacetic acid

PT-235 [일반]

Analysis of optimized chemically defined minimal media for sweet protein brazzein industrial scale expression in *Kluyveromyces lactis*

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Brazzein is an intense sweet protein with high stability over a wide range of pH values and temperatures, due to its four disulfide bridges. Recombinant brazzein production through secretory expression in *Kluyveromyces lactis* is reported. Generally, recombinant protein expression in yeast uses complex media such as YPD(1% yeast extract, 2% Peptone, 2% Dextrose) and YPG(1% yeast extract, 2% Peptone, 2% Galactose). Protein expression with these complex media has difficulties in scale up to industrial scale such as high cost of complex media and complicated purification steps as various protein are expressed by unknown nutrients. On the other hand, brazzein production using optimized media has high purity product, because chemically defined minimal media is known for all nutrient compositions. In industrial scale, chemically defined minimal media can be modulated in nutrient composition easier than complex media, so it is easier to expand in scale. In the present study, chemically defined minimal media's carbon source, nitrogen source, inducer concentration, expression pH, temperature, and induced time is optimized. Glucose was selected among glucose, lactose, and glycerol as the carbon source. Decided nitrogen source was ammonium sulfate among 3 other sources; ammonium sulfate, ammonium nitrate, ammonium chloride. 3:1 in Carbon to Nitrogen ratio was found as the optimum value whereas in inducer concentration which is glucose to galactose ratio was 5:1. All expression level was confirmed through SDS-PAGE and densitometry analysis. Amount of brazzein expressed in optimized chemically defined minimal medium showed approximately 1.5 increase in fold than that of optimized complex medium. From these results, optimum conditions for chemically defined minimal media to achieve highest purity and the scale up are fixed.

PT-236 [일반]

Quantitative assay of secretory expressed sweet protein brazzein in *Kluyvermyces lactis* with complex media

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Recently, a low-calorie sugar substitute that can be healthful and naturally available is in high demand since over-consumption of sugar and artificial sweeteners has various side effects such as hypertension, hyperlipidemia, diabetes, and obesity. To meet this demand, studies on sweet-tasting proteins have been pursued actively. Among these, brazzein, derived from the fruit of the West African *Pentadiplandra brazzeana* Baillon plant, has attracted much attention as a candidate sweetener, because of its potential sweetness, sugar-like taste, and good stability at high temperature and wide range of pH. Numerous attempts to produce brazzein in microorganisms and transgenic plants have been performed because of the difficulty and the limitations in obtaining the natural source of brazzein. Recently, we reported the secretory expression of recombinant brazzein in the yeast *Kluyveromyces lactis*, which is "generally regarded as safe" (GRAS). Our goal is to commercialize brazzein as the natural sweetener as the alternative option of sugar through the secretory expression of *Kluyveromyces lactis*. To establish the mass production of brazzein, first the fixation of fermentary conditions such as pH, temperature, the time of inducer input are needed for maximum efficiency in expression. In the present study, we cultivated *Kluyvermyces lactis* in complex media with 3 variable factors for mass production. The factors set are pH, temperature and the time of adding an inducer. We found that culturing at 23℃ with the pH of 7.0 and inducer put in at the start(0hr) of the fermentation showed the highest yield in expressing brazzein. Expressed volume of brazzein was quantified in SDS-PAGE and UV spectrometer. Optimized condition was tested in batch fermentation as a result the amount of brazzein is increased approximately 2.5 times the existing fermentation in densitometric assay. The optimization of cultivation is expected to be proven useful in the future when brazzein mass production is constructed to commercialize it as a substitute of sugar

PT-237 [일반]

Synthesis of (R)-Phenylglycinol 1-adamantanecarbonyl derived chiral stationary phase and application

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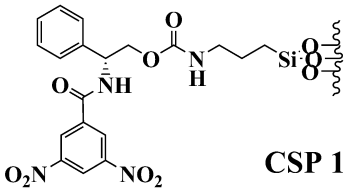
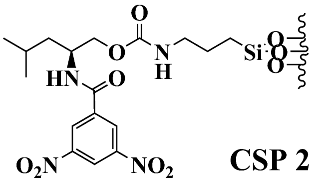
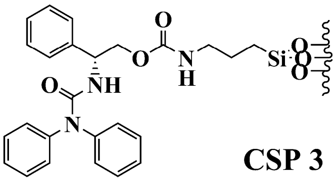
Previously, (R)-phenylglycinol 3,5-dinitrobenzoyl(DNB) derived chiral stationary phases (CSP1, 2) were used for the resolution of various chiral analytes.[1-3] In this study, different kind of (R)-phenylglycinol and (S)-leucinol derivatives were synthesized with 1-adamantanecarbonyl chloride instead of DNB-Cl. The derivatives were applied to CSPs and the CSPs were used for separation of various chiral samples containing chiral drugs.



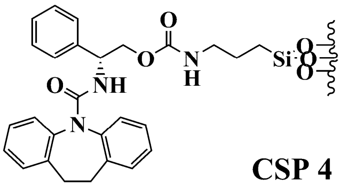
CSP 1



CSP 2



CSP 3



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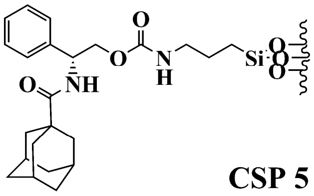
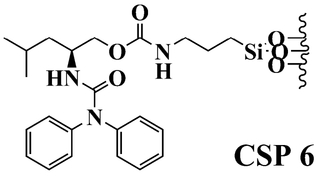


CSP 5



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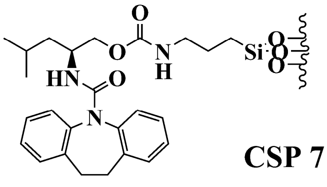

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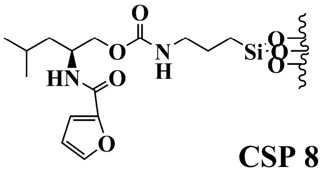

CSP 8

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PT-238 [일반]

Synthesis of (S)-Tryptophanol and (R,R)-Threoninol derived chiral stationary phases and application

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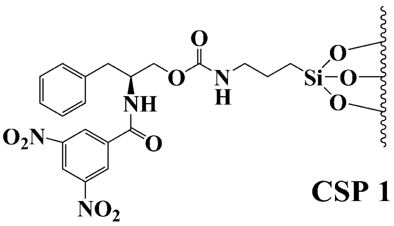
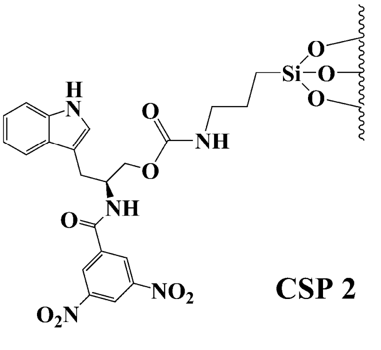
Various chiral amino alcohol derived chiral stationary phases (CSPs) including phenylglycinol, leucinol, alaninol were synthesized and used for resolution of various chiral analytes.[1,2]

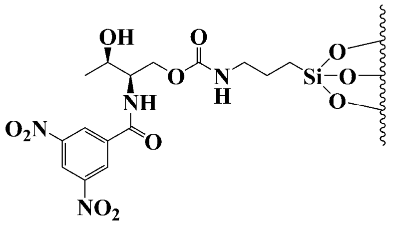
In this study, phenylalaninol, tryptophanol and threoninol derived new CSPs were prepared and used for resolution of ten chiral analytes. The structure of phenylalaninol is very similar to that of phenylglycinol except distance between chiral center of the phenyl group. On the other hand, tryptophanol has indole group compared to phenyl group of phenylalaninol. Threoninol has two chiral center without phenyl group. Chiral separation of various chiral analytes was performed on these CSPs.



CSP 1



CSP 2



CSP 3

[1] S.H. Im, J.J. Ryoo, *Chirality* 14 (2002) 329.
[2] J.J. Ryoo, T.H. Kim, S.H. Im, Y.H. Jeong, S.H. Choi, K.P. Lee, J.H. Park, *J. Chromatogr. A* 987 (2003) 429.

PT-239 [일반]

New and innovative additives for use in reclaimed asphalt pavements

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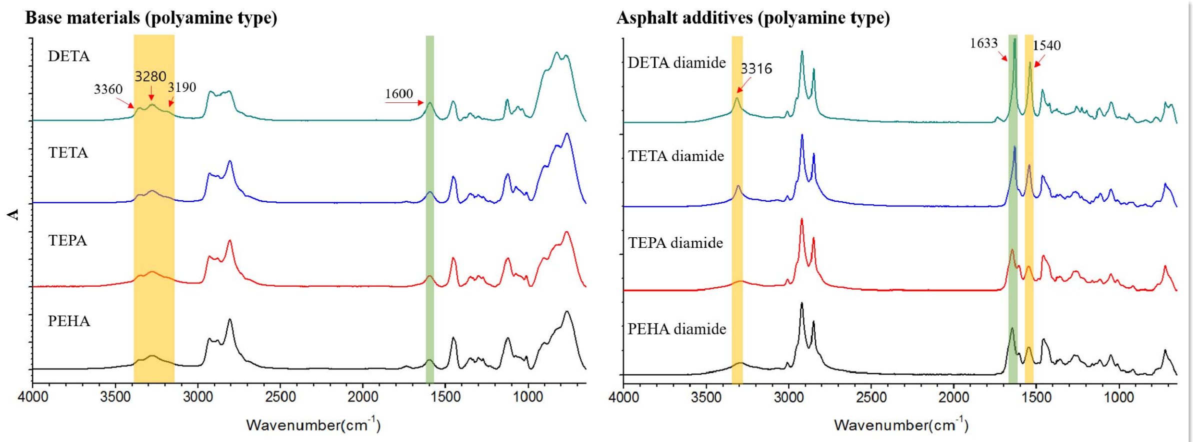
The Korean Government has implemented a legal system that permits the waste of construction material to be recycled and disposed in an environmentally and friendly manner. For instance, in January 2016, the Administrative Regulations allowed the use of recycled aggregate in road pavement (i.e., the recycled aggregate should be more than 40 % of the total amount of aggregate used). Due to the continuous increase of waste materials in South Korea, there is an urgent need to manage them through recycling process. By mixing this waste with the appropriate products and additives, the asphalt peeling due to water damage and plastic deformation can be avoided; improving thereby the performance of road pavement.

In order to reduce the peeling of asphalt pavement, we have synthesized new amide-based cationic additives, with high-chemical structure stability, by using one type of vegetable oil and seven different types of diamine and polyamine samples. Analytical techniques such as FT-IR and ^{1}H-NMR were employed to confirm the complete synthesis. Then, the effect of these additives was investigated on an artificially aged pavement specimens (using RTFO (Rolling Thin Film Oven)). Interestingly, the results showed that the physcial properties like the elastic recovery rate and the plastic strain were significantly improved compared to controls.



DETA: Diethylenetriamine ; TETA: Triethylenetetramine ; TEPA: Tetraethylenepentamine ; PEHA: Pentaethylenehexamine

PT-240 [일반]

An analysis of physicochemical properties of petroleum and natural asphalts

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There are many studies have been conducted to improve the performance of asphalt for road pavement. However, most studies focus on performance improvement studies through the analysis of the physical properties of asphalt. The asphalt consists of four main components: saturates, aromatics, resins, asphaltenes [1]. Their physical and rheological properties such as ductility, softening points, and viscosity are different depending on their composition [2]. Therefore, it is necessary to study that predict the properties of asphalt by analyzing chemical composition [3, 4]. In this study, two types of asphalt were analyzed: petroleum asphalt (PA) and natural asphalt (NA).

For characteristic analysis, the analysis was conducted using the analysis of elemental analysis, thin-layer chromatography with flame ionization detection, Raman spectroscopy, Fourier transform infrared spectroscopy, Nuclear magnetic resonance spectroscopy, UV-Vis spectroscopy, X-ray diffraction, Differential scanning calorimetry and Thermogravimetric analysis, penetration, softening point, ductility, and viscosity tests.

The result shows that PA and NA have a distinct difference in SARA formation. The average molecular weight of PA was 328 Da and NA was 252 Da. As a result of FT-IR analysis, NA has a lower aromatic carbon than PA. In addition, the clay ingredient appears in NA but the PA does not exist.

In conclusion, there was a significant difference in the physicochemical properties of both asphalt and the results of the physical and rheological properties were also shown differently.

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PT-241 [일반]

Hyperpolarized silicon nanoparticles as biocompatible imaging agents for magnetic resonance imaging

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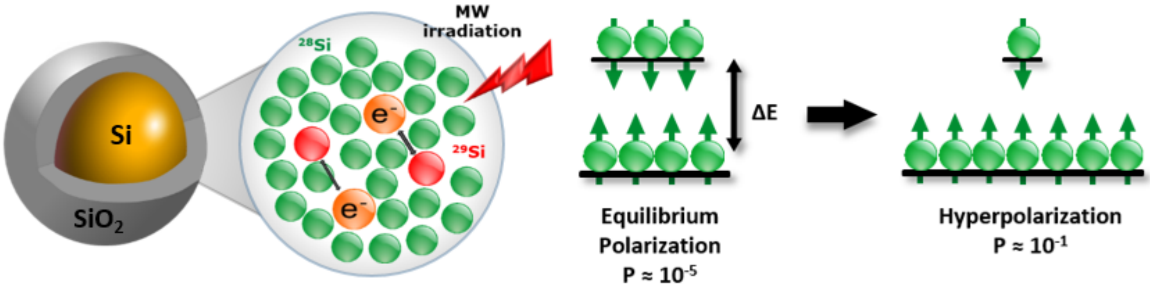
Silicon-based nanoparticles have been attracting a lot of interest in the field of biomedical applications due to their biocompatibility and biodegradability in vivo, as well as their flexible surface chemistry. Here, we investigated silicon nanoparticles (Si NPs) as hyperpolarized contrast agents for magnetic resonance imaging (MRI). The Si NPs have many great benefits to the hyperpolarized MR imaging. Since a core region of the crystalline Si NPs is mostly protected from a main relaxation source, such as paramagnetic centers existing at surface defect sites, the Si NPs show extremely long depolarization times (usually longer than 30 mins), resulting in high MR image contrast with minimum or no background signals. In addition, paramagnetic centers on the surface defect sites play a pivotal role in generating MR signal enhancements induced by dynamic nuclear polarization (DNP) processes, thereby not necessary to add external radical sources. Two different synthetic approaches were demonstrated in order to yield Si NPs ranging from 5 nm to 500 nm sizes i) The particles were synthesized by means of a chemical reduction of micelles formed by mixing silicon tetrachloride and alkyltrichlorosilane. ii) Magnesiothermic reduction of silica was also processed to produce Si NPs. Several spectroscopic results suggest that the synthesized Si NPs can potentially be utilized as biocompatible and targetable contrast agents for hyperpolarized MRI researches.



PT-242 [일반]

Synthesis and characterization of graphene-enfolded TiO_2 anatase as anode materials for Li-Secondary batteries

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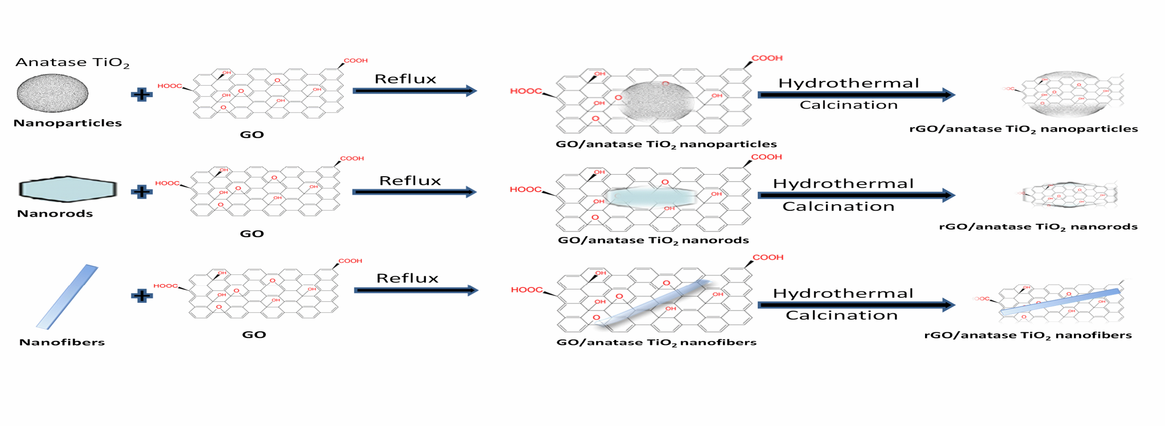
Using graphene oxide (GO) and titanium dioxide (TiO_2), various types of composites comprised of graphene-bonded and enfolded anatase TiO_2 were synthesized without employing a cross-linking reagent in this study. Graphene sheets were uniformly dispersed among the anatase TiO_2 particles, to enhance the cyclability and electronic conductivity of the TiO_2 anode for lithium ion batteries. A composite of GO prepared with three types of anatase TiO_2 (nanoparticles, nanorods and nanofibers) were synthesized by hydrothermal and calcination treatment. The reduction of GO increased simultaneously after calcination under argon atmosphere at 400 °C for 4 h. To achieve overall better electrochemical performance we used the anatase type of TiO_2. The physicochemical properties were characterized by scanning electron microscopy (SEM), transmission electron microscopy (TEM), X-Ray powder diffraction (XRD), X-ray photoelectron spectroscopy (XPS) and Raman spectroscopy. Surface properties were measured by the Brunauer-Emmett-Teller (BET) & Barrett-Joyner-Halenda (BJH) method. The electrochemical properties were also investigated by charge-discharge and Electrochemical Impedance Spectra (EIS). The TiO_2 nanoparticles, having unique morphologies and composites with graphene, exhibited discharge capacities of 68 mAh g^{-1} at a current density of 10 C and achieved a reversible capacity of 52 mAh g^{-1} after 100 cycles. It delivered high rate capability of 156 mAh g^{-1} at 0.5 C and restored the rate capacity of 109 mAh g^{-1} even after 20 C, this high reversibility and rate capacity corresponds to crystallinity, high surface area of (125 m^2g^{-1}), less electrolyte and interfacial resistance. We believe that reduced graphene oxide (rGO)/anatase TiO_2 nanoparticles composite are expected to be used as an anode material for next generation lithium secondary batteries.



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PT-243 [일반]

Simultaneous determination of residual pesticide in tea using dispersive liquid-liquid microextraction(DLLME) and HPLC-UV

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The objective of this study is to develop an optimized dispersive liquid-liquid microextraction (DLLME) conditions and sample preparation procedure for determination of residual pesticide (Famphur and Fenpyroximate) in tea. Pesticide were extracted and concentrated using small volume of dispersive and extraction solvent from 5 mL of aqueous sample effectively and chromatographic separation was achieved on Eclipse XDB-C18 column (4.6 mm i.d. x 150 mm length, 5 μm particle size) with mobile phase of acetonitrile/water mixture, and the characterization and determination were carried out on HPLC-UV system. Optimized extraction conditions with respect to the effects of dispersive solvent, extraction solvent, pH of sample, and salting-out effect were established. The optimized results showed increased enrichment factors. The limits of detection(LOD) and limits of quantitation(LOQ) in the spiked sample were in the concentration range of 5.82~6.05 ng/mL and 19.40~20.16 ng/mL, respectively. In the concentration range of 0.10~8.00 mg/L, the calibration curves were showed the good linearities with correlation coefficients (r^2) from 0.9943 to 0.9961. The accuracy and precision performed in the working range. The established method was applied to monitor five types of commercially available tea.

PT-244 [일반]

Deionized water recycle system for reagent free ion chromatography

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Ion Chromatography (IC) is one of the most widely employed analytical techniques for the determination of ionic species in process and environmental monitoring of which time often spans from weeks to months. For ensuring high measurement data quality IC needs to be run at its optimal and constant operating conditions. For these applications Reagent Free IC with eluent generation (RFIC-EG) is preferably used as it enables the user to perform a wide range of ion chromatographic separations using deionized (DI) water as the only carrier. Admitting that RFIC-EG system only requires periodic replenishment of Di water, it is not a trivial job to keep DI water clean. Herein we introduce a simple DI water recycle method which extends RFIC-EG running time by up to twenty times longer. With this method 2 mm micro-bore IC can be run as long as two months with a four liters eluent bottle.

The schematics of DI water recycle system is shown in Figure 1. The suppressor in RFIC-EG is configured in recycle mode. The effluent from the first suppressor regenerant chamber is either an acidic solution (in cation system) or a basic solution (in anion system) with oxygen gas, hydrogen gas and ions injected as sample. It is directed to a bubble trap where all the gases are removed. Resulting degassed effluent flows through a same type 2nd suppressor which runs in recycle mode. The 2nd suppressor regenerant flow splits using a T in normally 1 to 10 ~ 20 ratio. Low flow is directed using a solenoid pump to the second suppressor regenerant channel while high flow to the eluent bottle. Between the T-splitter and eluent bottle, there are three columns; They are by-products elimination column (ER3a, Dionex), catalytic gas elimination column (ER3b, Dionex), the mixed bed ion exchange water purification column (MR450 UPW, DOWEX™ MONOSPHERE™).

The recycle IC systems (cation and anion) were tested by analyzing standard solutions over three months. The system details and test results will be presented.

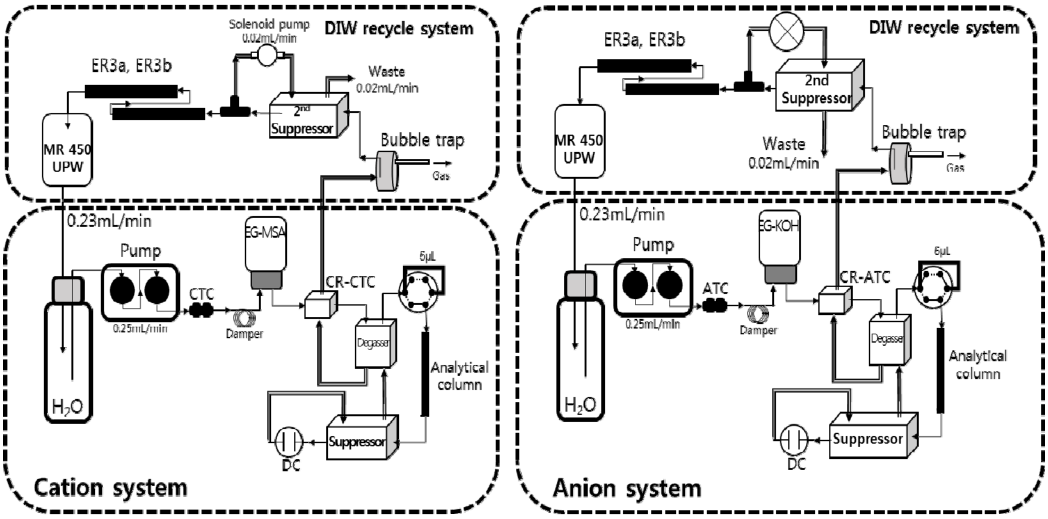

Figure1. Schematics of Reagent Free IC with DI water recycling.

PT-245 [일반]

^{1}H-NMR based metabolomic studies of VHSV infected olive flounder

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Viral hemorrhagic septicaemia virus (VHSV), an etiologic agent of viral hemorrhagic septicaemia (VHS) in over 48 different fish species has a wide distribution, including Europe, the USA, Canada, Japan, and Korea [1]. VHSV is a negative sense single-stranded RNA (ssRNA) Novirhabdovirus from the family of Rhabdoviridae [2]. The olive flounder (Paralichthys olivaceus), an economically important fish species in Korea and Japan, has shown high morality to VHSV [3]. Viral hemorrhagic septicemia virus (VHSV) is an etiologic agent of viral hemorrhagic septicemia (VHS) in the aquaculture of olive flounder (*Paralichthys olivaceus*).

In this study, ^{1}H-nuclear magnetic resonance (NMR) spectroscopy was used to profile the metabolomic differences between VHSV infected olive flounder and non-infected controls under laboratory conditions. Multivariate data analysis demonstrated that the infection caused a discrete metabolic profiles in the extracted tissues, including kidney, spleen, and liver.

The major metabolite changes were related to modifications of amino acid metabolism and osmolyte production. The significantly increased hepatic alanine demonstrated that the fish metabolism might be changed to resist the infection via supporting hepatic leukocytes. As a non-destructive method, 1H-NMR based metabolomics might provide a fast and simple method for the development of databases specific to fish metabolites under various biological and environmental stresses.

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PT-246 [일반]

Headspace in-tube microextraction (HS-ITME) of dichlorophenols using a commercial capillary electrophoresis instrument

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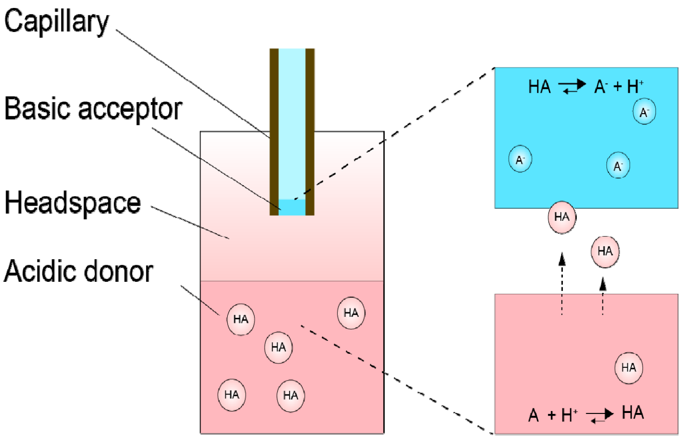
Solid phase microextraction (SPME) and liquid phase microextraction (LPME) are commonly employed for headspace (HS) extraction, which is useful for the concentration of volatile materials in a complex matrix. Among LPME methods, single drop microextraction (SDME) is widely used for HS extraction to be off-line coupled with GC and LC. By forming a single acceptor drop at the tip of a capillary using a commercial capillary electrophoresis (CE) instrument, we showed that SDME can be easily in-lined coupled with CE to achieve high sample enrichments in a short time. However, it is difficult to hang a drop of very small volume to a separation capillary in the HS stably for long extraction. Recently this problem was solved by in-tube microextraction (ITME) using the liquid plug inside the capillary as an acceptor phase without hanging a drop. HS-ITME-CE was performed to enrich dichlorophenol in an aqueous solution. To promote the evaporation of the acidic dichlorophenols into the HS as neutral forms, the donor was acidified by adding HCl. To prevent back extraction from the HS, a short acceptor plug of 500 mM phosphate buffer of pH 11 was used. The subsequent CE was carried out using a run buffer of 240 mM borate buffer of pH 9.2. With a 10-min extraction at 60°C, dichlorophenols were enriched about 40~540 times.



[1] H. R. Lee, S. M. Cho, J. Kim, and D. S. Chung, J. Chromatogr. A (2014) 117
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PT-247 [일반]

Headspace in-tube microextraction for analysis of volatile compounds by capillary electrophoresis mass spectrometry

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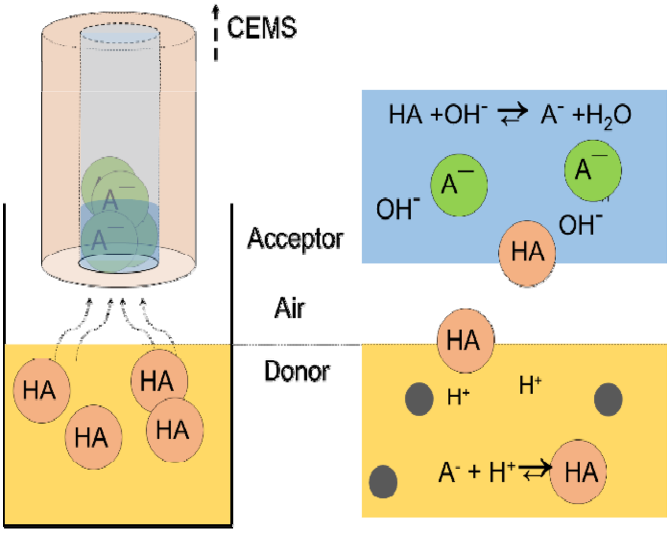
Single drop microextraction (SDME) can be in-line coupled with capillary electrophoresis mass spectrometry (CEMS) by blocking electrospray (ESI) spray tip with a rubber-sealed vial. The small surface-to-volume ratio of the drop enables high enrichment factors (EFs) to be obtained in a short time. One practical issue in SDME is the difficulty of keeping the drop attached to the capillary stably. Attaching the vial to ESI spray tip is quite effective however, there is a chance to interrupt the best position for stable ESI and tip conditions. Headspace in-tube microextraction uses same principle but have no drop. This requires only to keep the ESI from aspiration. Trichlorophenols and short chain fatty acids are tested as examples of volatile organic compounds.



PT-248 ［일반］

Concentration of natural radioactive materials by grain size

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Changes in the concentration of natural radioactive materials were observed according to the grain size of the soil. The sample is a black slate of Deokpyeong-ri, Cheoncheon-myeon, Goesan-gun, Chungcheongbuk-do. It is a dense metamorphic rock with dark black clay belonging to the Kureongsan Formation of the Okcheon Group. The slate was crushed and passed through a 10 mesh (2 mm) sieve to obtain 18 mesh (18 mesh: 1 mm), 40 mesh (40 mesh: 0.425 mm), 60 mesh (100 mesh: 0.15 mm) and 200 mesh (200 mesh: 0.075 mm) sieves. Assuming that the grain is a sphere, the surface area dependence of the grain size is $135,648*X^{-1}$. The measuring container was a cylindrical U-8 (acrylic material) container having an inner diameter of 48 mm and a height of 61 mm. The sample was filled up to 50 mm in the measuring vessel, sealed with epoxy, and allowed to stand for one month so that the radium and its decay product were in radioactive equilibrium. The radionuclides were radium-226, potassium-40 and thorium-232, and gamma-ray spectra were measured for 30,000 seconds. The gamma-ray spectrometer was a 28% p-type HPGe detector (ORTEC). The radioactivity concentrations of radium-222, thorium-232 and potassium-40 were 4.1 to 15.0 Bq/g, 0.39 to 0.51 Bq/g and 0.014 to 0.030 Bq/g. The concentration of radioactivity in radium-222 and thorium-232 increased with decreasing particle size, but no difference according to particle size in potassium-40. This is presumed to be due to the characteristic that the clay has anions in a plate-like structure and adsorbs the heavy metal having a cation between the layer and the layer of the clay.

PT-249 [일반]

Cross talk eliminated six-color detection of single cell imaging; application to monitoring obesity-induced insulin resistance in adipocyte and HepG2 cell co-culture

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Primary cell cultures mimic the physiology and genetic makeup of in-vivo tissue of origin, nonetheless, a complication in the derivation and propagation of primary cell culture limits its use in biological research. However, in-vitro models using primary cells might be a complement model to mimic in vivo response. But, conventional techniques such as western blot and PCR employed to study the expression and activation of proteins requires a large number of cells, hence repeated establishment and maintenance of primary culture are unavoidable. Quantum dot (Q-dot) and acousto-optic tunable filters (AOTF) based multiplex imaging system is a viable alternative choice to evaluate multiple signaling molecules by using a small number of cells. Q-dots have broad excitation and narrow emission spectra, which allows to simultaneously excite multiple Q-dots by using single excitation wavelength. The use of AOTF in the fluorescence detection system enables to scan the fluorescence emission intensity of a Q-dot at their central wavelength, this phenomenon effectively avoids spectral overlap among the neighboring Q-dots. When Q-dots are conjugated with antibodies it acts as effective sensing probes. To validate this, the expression pattern of p-JNK-1, p-GSK3b, p-IRS1ser, p-IRS1tyr, p-FOXO1, and PPAR-g, involved in the insulin resistance were concurrently monitored in adipocyte and HepG2 co-cell culture model. The observed results clearly indicate that PPAR-g is the critical component in the development of insulin resistance. Moreover, the results proved that developed Q-dot based AOTF imaging methodology is a sensible choice to concurrently monitor multiple signaling molecules with limited cell population.

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PT-250 [일반]

Synthesis and monitoring of high-valence silver propamidine nanoparticles for diabetic foot ulcer treatment

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Diabetic foot ulcer (DFU) is becoming more serious concern as it affects 95% of diabetic patients worldwide. It has been shown that the *Staphylococcus aureus* and other Gram negative microorganisms are the main reasons behind this disease. Though many antibiotics are presently used to treat the DFU, due to increased bacterial resistance, new alternative therapies are always welcome. To address this alarming issue, we have designed and synthesized the high-valence silver propamidine (Ag(II)PRO) complex as well as nanoparticles and characterized both by usual spectroscopic methods. The reverse microemulsion technique has been applied to synthesize Ag(II)PRO nanoparticles and its antibacterial activity has been compared with zero-valence silver nanoparticles (AgNPs) with similar size. The antibacterial efficacies of Ag(II)PRO nanoparticles and AgNPs were tested against Gram-negative and Gram-positive organisms responsible for DFU. The newly synthesized high-valence Ag(II)PRO nanoparticles showed higher antibacterial activity compared to silver-only nanoparticles (AgNPs). This study concludes that the high-valence Ag(II)PRO nanoparticles show better antibacterial activity than AgNPs and they may serve as the next generation therapeutic agent for the diabetic wound care.

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PT-251 [일반]

Pin point analysis method using primary ion beam alignment

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Due to the increase in display resolution, the pattern size of many layer of TFTs is becoming smaller and smaller, so that the need for analysis technology of fine regions is gradually increasing. In order to find optimal conditions for the fine pattern analysis using ToF-SIMS, this study measured Fast imaging mode with good image resolution and Spectrometry mode with good mass resolution, among the modes of Primary ion gun. And we set the optimum condition using beam alignment. Later, when analyzing similar types of micro-pattern, this mechanism and analysis process can be used to quickly access the cause and solution

PT-252 [일반]

Determination of traces of organic additives in traditional lime mortars: A preliminary study

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Lime mortar is a one of the important traditionally materials used in architectural cultural heritages. Hanbongseong, which is one of the extended defensive walls of Namhansanseong Fortess, has not been remodeled since the reconstruction in King Yeongjo, and it has kept a preservation section where the materials remained intact. This study was carried out to analyze various samples of the lime mortars collected from Hanbongseong in Namhansanseong Fortess, which is presumed to have traces of organic additives. The lime mortars as binders were analyzed by using a stereoscopic microscope and an ESEM to confirm the remaining trace of the plant on the surface. In addition, FT-IR analysis confirmed the addition of organic materials and their characteristics. In this study, we can use the lime mortars as basic data for studying the mixing ratio and construction method of the Joseon Dynasty.

인명색인

총회 식순

일 시: 2017. 11. 08(수), 17:30
장 소: 제주 ICC 5층
사 회: 황승율 사무총장

□ 개 회

□ 국민의례

□ 개 회 사 (한국분석과학회 김태승 회장)

□ 시 상
- DI 분석과학상
- 성문 우수 논문상
- Leco 젊은 분석과학자상
- 우수 구두 발표 상
- 우수 포스터 상

□ 결산 및 업무 보고
- 2017년도 업무 보고
- 2017년도 수입 · 지출 현황
- 2018년도 임원(안)
- 차기 수석부회장 선거 결과
- 2018년도 사업계획서(안)
- 2018년도 예산(안)

□ 심의 안건 및 토의
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신지영, 강다영, 김상현, 정의도

본 학회의 Analytical Science & Technology에 게재된 「부산 가덕도 장항 유적 출토 인골의 안정동위원소 분석을 통해 본 신석기시대의 식생활 양상」이라는 논문이 피인용지수가 높은 우수 논문으로 선정되어, 본 학회의 발전에 지대한 공헌을 하였기에
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서울대학교 정 선 경

귀하는 2017년도 제58회 춘계 학술대회에서 「Automatic liquid extraction surface analysis coupled with commercial capillary electrophoresis for sensitive detection of pesticides on surface」라는 논문을 발표하여 우수 구두 발표 상으로 선정되었기에 이 상장을 드립니다.

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경희대학교 이 원 웅

귀하는 2017년도 제58회 춘계 학술대회에서 「Profiling of a wide range of neurochemicals in human urine by ultra performance liquid chromatography-tandem mass spectrometry combined with in situ selective derivatization」이라는 논문을 발표하여 우수 구두 발표 상으로 선정되었기에 이 상장을 드립니다.

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위 연구진은 2017년도 제58회 춘계 학술대회에서 「Application of extracted common ion chromatogram and neutral loss scan for rapid screening of sulfonamide in supplements by UHPLC-Q/TOF-MS」라는 논문을 발표하여 우수 포스터로 선정되었기에 이 상장을 드립니다.

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서울여자대학교 【박은지, 권소연, 이인숙】

위 연구진은 2017년도 제58회 춘계 학술대회에서 「Determination of tetracycline using the hybridization of aptamer」라는 논문을 발표하여 우수 포스터로 선정되었기에 이 상장을 드립니다.

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우수 포스터 상

국립환경과학원, 요코하마 국립대학교

【오정근, 김기헌, 신선경, 마스나가 시게키】

위 연구진은 2017년도 제58회 춘계 학술대회에서 「CALUX bioassay 생식독성평가를 적용한 HBCD 및 그 분해산물의 유해성 평가」라는 논문을 발표하여 우수 포스터로 선정되었기에 이 상장을 드립니다.

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위 연구진은 2017년도 제58회 춘계 학술대회에서 「Real-time monitoring and background level of atmospheric radon-222 concentrations at gosan site, jeju island in 2016」이라는 논문을 발표하여 우수 포스터로 선정되었기에 이 상장을 드립니다.

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2017년도 업무 보고

2017. 01. 01 ~ 2017. 11. 08

[추진 사항]

01.12	2017년도 제1차 이사회 개최 및 신년 하례식
01.16	2017년도 1차 연회비 청구
01.19	신 임원 명단 보고 및 승인 신청 (국립과천과학관)
01.25	부가가치세 2기 확정 신고
01.31	2016년도 사업 실적 및 국내 학술지 발행 지원 결과 보고서 제출 (과총)
02.25	분석과학회지 Vol. 30(1) 발간
02.27	비영리 법인 업무 현황(2016년 사업 실적 및 2017년 사업 계획) 제출 (국립과천과학관)
02.27	제58회 춘계 학술대회 홍보 포스터 발송
03.01	영인 분석과학자상, Leco 젊은 분석과학자상 추천 공고
03.28	공익법인 사업계획 및 예산보고서, 사업실적 및 결산 보고서 제출(국립과천과학관)
03.31	세계 학술대회 지원금 신청(과총)
04.13	2017년도 제2차 이사회 개최, 영인 분석과학자상, Leco 젊은 분석과학자상 선정, 춘계 학술대회 보고 등
04.18	국내 학술지, 국내 학술대회 지원금 신청 (과총)
04.25	부가가치세 1기 예정 신고
04.25	분석과학회지 Vol. 30(2) 발간
04.27	제58회 춘계 학술대회 일정 홈페이지 공지
05.18-19	제58회 춘계 학술대회 (장소 원주 인터불고 호텔 예정)
06.25	분석과학회지 Vol. 30(3) 발간
07.12	2017년도 2차 연회비 청구
07.21	차기 수석부회장 선거 일정 공고
07.25	부가가치세 1기 확정 신고
08.16	Leco 젊은 분석과학자상 추천 공고
08.25	분석과학회지 Vol. 30(4) 발간
08.09	제59회 추계 학술대회&HPLC 2017 홍보 포스터 발송
08.18	DI 분석과학자상 선정위원회 구성
10.12	제59회 추계 학술대회 일정 홈페이지 공지
10.12	2017년도 제3차 이사회 개최. 차기 수석부회장 의결. DI 분석과학자상, Leco 젊은 분석과학자상, 우수 논문상 선정, 차기 임원 선임, 추계 학술대회 보고 등
10.25	부가가치세 2기 예정 신고
10.25	분석과학회지 Vol. 30(5) 발간
11.5-10	제59회 추계 학술대회 및 총회 (11.8-10), HPLC 2017 Jeju (11.5-9), 제주 ICC

[예정 사항]

12.25	분석과학회지 Vol. 30(6) 발간

2017년도 수입 · 지출 현황

(2017.01.01. ~ 2017.09.30.)

수입		지출	
세과목	금액(원)	세과목	금액(원)
1. 회비	**8,895,556**	**1. 학회지**	**22,290,991**
개인회비(일반)	4,492,143	학회지 발간비	7,524,000
(학생)	1,577,008	학회지 발송비	1,873,770
도서관회비	448,185	편집운영비	12,893,221
단체 회비	889,110		
종신회비	1,489,110	**2. 이사회 운영비**	**5,015,400**
		활동비	4,205,400
2. 학술대회	**207,992,434**	교통비	810,000
춘계 학술대회	74,400,440		
추계 학술대회	10,096,938	**3. 임원 활동비**	**5,512,340**
HPLC 2017	120,521,254	활동비	4,146,440
ACS	2,973,802	교통비	1,365,900
		4. 사무관리비 및 기타	**29,785,929**
3. 학회지	**24,261,161**	우편 및 택배	724,030
광고료	17,600,000	사무용품 & 잡비	2,701,893
논문 게재료	4,105,143	급여 및 상여금	18,364,350
저작권료	2,556,018	전화 및 팩스사용료	530,496
		이체 수수료	26,200
		사무실 관리비	1,596,610
4. 과총 지원금	**52,290,000**	세무사 기장료	1,650,000
국내 학술대회	3,630,000	과총 연회비	1,500,000
세계 학술대회	48,660,000	카드기 임대료	99,000
		법인 등기비	302,240
		교통 및 출장비	1,814,110
5. 전년도 적립금	**50,000,000**	카드기 정보 변경비	30,000
		화환비 및 근조기	227,000
		이니시스 연관리비	220,000
6. 전년도 이월금	**64,061,606**		
(주거래)우리은행 입출금통장	28,118,212	**5. 학술대회**	**41,984,886**
우리은행입출금통장	28,685,964	춘계 학술대회	37,197,070
우체국 통장	7,257,430	추계 학술대회	4,119,430
		HPLC 2017	668,386
7. 기타 수입	**790,597**	**6. 세금**	**4,653,240**
이자수입	720,247	재산세	378,430
법인세 환급금	70,350	부가세	3,218,340
		주민세(법인)	70,240
		4대 보험료(기관부담)	986,230
		7. 당해년도 적립금	**50,000,000**
		8. 잔액	**249,048,568**
		우리은행 입출금 통장	196,335,563
		우리은행 입출금 통장	45,452,725
		우체국 퇴직금 통장	7,260,280
합계	408,291,354	합계	408,291,354

총 잔액 ₩ 299,048,568 (당해년도 적립금+ 잔액)

2018년도 임원(안)

직위	이 름	소속
회장	이승호	한남대학교 대덕밸리캠퍼스 화학과
감사	황승율	화학물질안전원 연구개발교육과
감사	정두수	서울대학교 화학과
수석부회장	조남준	한국기술교육대 에너지 신소재·화학공학부
총무부회장	김진석	한국표준과학연구원
편집위원장(부회장)	이원용	연세대학교 화학과
사무총장	배선영	서울여자대학교 화학과
학술부회장	한상범	중앙대학교 약대
홍보부회장	류재정	경북대학교 화학교육과
부회장(화학)	명승운	경기대학교 화학과
부회장(화학)	김종혁	한국화학연구원 분석센터
부회장(화학)	선일식	한국화학융합시험연구원 화학환경본부
부회장(환경)	신호상	공주대학교 사범대학 환경교육과
부회장(약학)	이용문	충북대학교 약학대학
부회장(약학)	강종성	충남대학교 약학과
부회장(재료/섬유)	박신화	포항산업과학연구원 분석평가그룹
부회장(식품/농화학)	김동술	식품의약품안전처 식품의약품안전평가원
부회장(식품/농화학)	표희수	KIST 생체대사연구센터
부회장(표준/원자력/안전)	송규석	한국원자력연구원 원자력화학연구부
부회장(법과학)	김남이	국립과학수사연구원 법화학과
부회장(여성분과)	신선경	국립환경과학원 환경자원연구부
이사(식품/농화학)	안장혁	차의과학대학교 식품생명공학과
이사(약학)	권성원	서울대학교 약학대학
이사(환경)	김희갑	강원대학교 환경학과
이사(재료/섬유)	최은경	한국생산기술연구원 섬유소재본부
이사(총무간사)	김병희	숙명여자대학교 식품영양학과
이사(총무간사)	이수연	계명대학교 약학대학
이사(총무간사)	서금희	한국기술교육대학교 산학협력단
이사(재무)	김태욱	한경대학교 환경공학과
이사(재무)	송준명	서울대학교 약학대학
이사(학술)	공광훈	중앙대학교 화학과
이사(학술)	이성광	한남대학교 대덕밸리캠퍼스 화학과
이사(학술)	정영림	서울의약연구소
이사(학술)	권오승	한국과학기술연구원 도핑컨트롤센터
이사(학술)	강성호	경희대학교 응용화학과
이사(학술)	이진숙	한국산업기술시험원
이사(학술)	윤정기	국립환경과학원 토양지하수연구과

이사(학술)	최기환	한국표준과학연구원
이사(학술)	안욱성	한국세라믹기술원 기업지원본부 수도권시험분석 , 기업지원센터
이사(학술)	한영지	강원대학교 환경융합학부
이사(학술)	이재형	한국화학융합시험연구원 환경보건팀
이사(학술)	김정권	충남대 화학과
이사(학술)	정의창	한국원자력연구원
이사(기획)	김상철	한국건설생활환경연구원 보건환경연구소
이사(기획)	백만정	순천대학교 약학대학
이사(기획)	윤혜온	한국기초과학지원연구원 서울센터
이사(기획)	정세훈	포항산업과학연구원 분석평가그룹
이사(기획)	이정애	KIST 분자인식연구센터
이사(기획)	김원석	서도비엔아이㈜
이사(기획)	박준호	서울과학기술대학교 정밀화학과
이사(기획)	이정미	성균관대학교 약학대학
이사(기획)	이후근	가천대학교 약학대학
이사(조직)	최용욱	전주대학교 환경시스템학과
이사(조직)	김기현	한양대학교 건설환경공학과
이사(조직)	임흥빈	충북대학교 특용식물학과
이사(조직)	김훈주	대구경북첨단의료산업진흥재단 임상시험신약생산센터
이사(조직)	허수정	식품의약품안전처
이사(조직)	김현주	한국교통대학교 교양학부
이사(조직)	박경수	한국과학기술원 특성분석센터
이사(조직)	조성찬	삼성 Display 분석기술팀
이사(조직)	표재성	경성대학교 약학과
이사(조직)	정재학	LG 산전 분석센터
이사(홍보)	민지숙	국립과학수사연구원 대구과학수사연구소
이사(홍보)	김윤석	K-water 수질분석 연구센터
이사(홍보)	조재억	한화케미칼 중앙연구소
이사(홍보)	길효식	SK이노베이션기술원분석Lab
이사(홍보)	남궁현	코오롱분석평가연구소
이사(홍보)	김혁년	LG display 파주분석팀
이사(홍보)	이창렬	KCC중앙연구소 분석평가센터
이사(홍보)	이군택	서울대학교 농생명과학공동기기원
이사(홍보)	유혜현	한양대학교 약학대학
이사(홍보)	한정희	한국기초과학지원연구원 환경과학연구부

발전 동력 위원회

직위	이름	소속
위원장(전임 회장)	김태승	국립환경과학원 환경기반연구부 토양지하수연구과

부위원장(부회장)	이덕희	랩프런티어
위원(부회장)	강창희	제주대학교 화학과
위원(부회장)	팽기정	연세대학교 원주캠퍼스 화학과
위원(부회장)	김인환	대구대학교 사범대학 화학교육과
위원(부회장)	이중주	단국대학교 천안캠퍼스
위원(부회장)	김효진	동덕여자대학교 약학대학
위원(부회장)	박용남	한국교원대학교 화학교육과
위원(부회장)	윤근성	인성 크로마텍
위원(부회장)	정민환	리코코리아
위원(부회장)	윤석화	써모사이언티픽코리아㈜
위원(부회장)	이창선	퍼킨엘머코리아
위원(부회장)	노경원	㈜신코 연구개발부
위원(부회장)	이성희	㈜지올코리아
위원(부회장)	김문해	㈜성문시스텍

2018년도 사업계획서(안)

01.11 2018년도 제1차 이사회 개최 및 신년 하례식
01.25 2018년도 1차 연회비 청구
01.15 신 임원 명단 보고 및 승인 신청 (국립과천과학관)
01.25 부가가치세 2기 확정 신고
01.31 2017년도 사업 실적 및 국내 학술지 발행 지원 결과 보고서 제출 (과총)
02.25 분석과학회지 Vol. 31(1) 발간
02.28 비영리 법인 업무 현황(2017년 사업 실적 및 2018년 사업 계획) 제출 (국립과천과학관)
02.28 제60회 춘계 학술대회 홍보 포스터 발송
03.02 영인 분석과학자상, Leco 젊은 분석과학자상 추천 공고
03.30 공익법인 사업계획 및 예산보고서, 사업실적 및 결산 보고서 제출(국립과천과학관)
03.30 국내 학술지, 국내 학술대회 지원금 신청 (과총)
04.12 2018년도 제2차 이사회 개최, 영인 분석과학자상, Leco 젊은 분석과학자상 선정,
춘계 학술대회 보고 등
04.25 부가가치세 1기 예정 신고
04.25 분석과학회지 Vol. 31(2) 발간
04.27 제60회 춘계 학술대회 일정 홈페이지 공지
05.17-18 제60회 춘계 학술대회 (경주 현대 호텔/ 창립 30주년 기념 행사)
06.25 분석과학회지 Vol. 31(3) 발간
07.13 2017년도 2차 연회비 청구
07.20 차기 수석부회장 선거 일정 공고
07.25 부가가치세 1기 확정 신고
08.18 Leco 젊은 분석과학자상 추천 공고
08.25 분석과학회지 Vol. 31(4) 발간
09.03 제61회 추계 학술대회 홍보 포스터 발송
08.06 DI 분석과학자상 선정위원회 구성
10.11 2018년도 제3차 이사회 개최. 차기 수석부회장 의결.
DI 분석과학자상, Leco 젊은 분석과학자상, 우수 논문상 선정.
차기임원 선임, 추계 학술대회 보고 등
10.25 부가가치세 2기 예정 신고
10.25 분석과학회지 Vol. 31(5) 발간
11.15-16 제61회 추계 학술대회 및 총회 (거제 마리나 리조트)

12.25 분석과학회지 Vol. 31(6) 발간

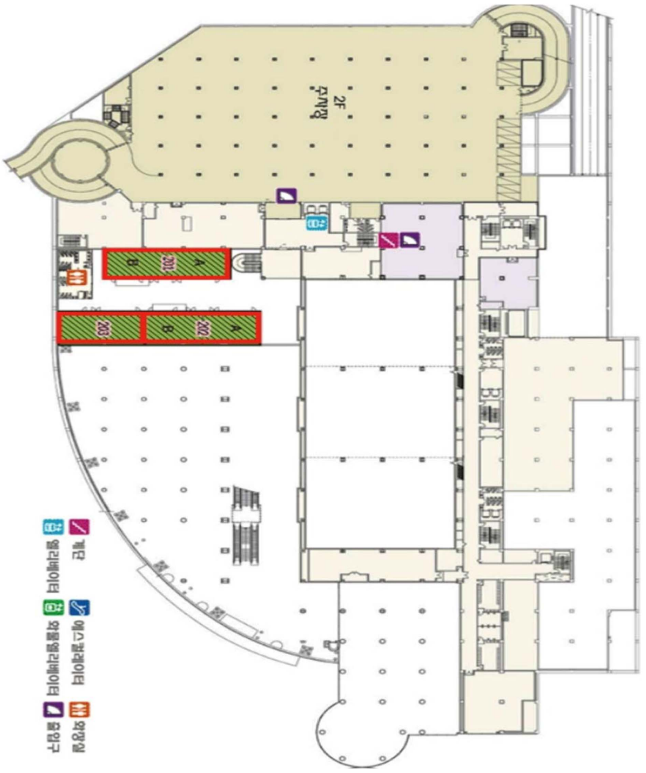
2018년도 예산(안)

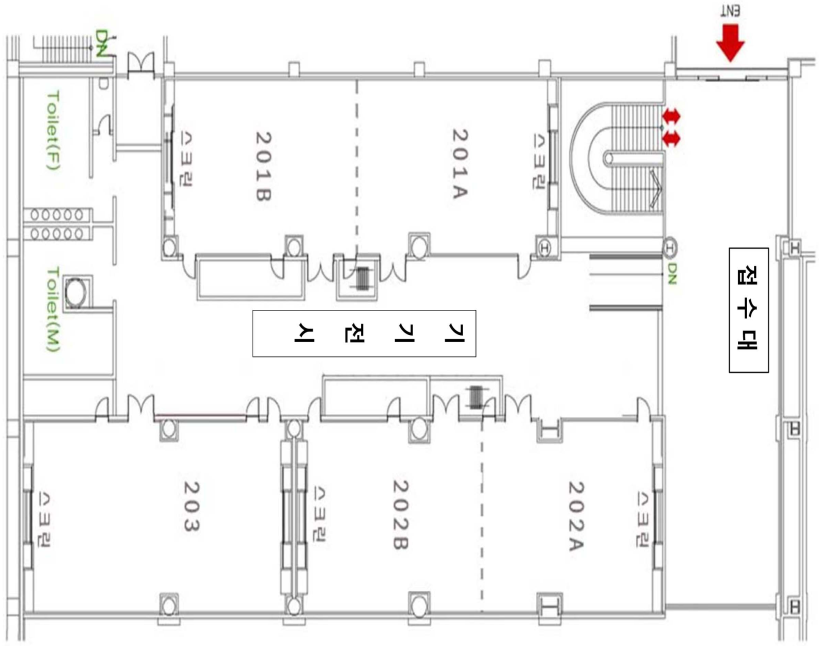
(2018.01.01. ~ 2018.12.31.)

수입		지출	
세과목	금액(원)	세과목	금액(원)
1. 회비	**11,200,000**	**1. 학회지**	**39,500,000**
개인 회비	8,000,000	학회지 발간비	13,000,000
도서관회비	500,000	학회지 발송비	3,500,000
단체 회비	1,200,000	편집운영비	23,000,000
종신 회비	1,500,000		
		2. 이사회 및 임원 운영비	**11,000,000**
		활동비	8,000,000
2. 학술대회	**120,000,000**	교통비	3,000,000
춘계 학술대회	70,000,000		
추계 학술대회	60,000,000	**3. 사무관리비**	**46,800,000**
		우편 및 택배	1,000,000
		사무용품 & 잡비	2,6150,000
		급여 및 상여금	24,583,000
3. 학회지	**50,000,000**	전화 및 팩스 사용료	600,000
광고료	40,000,000	이체 수수료	100,000
논문 게재료	8,000,000	사무실 관리비	2,500,000
저작권료	2,000,000	세무사 기장료	2,000,000
		과총 회비	1,500,000
		카드기 대여료	132,000
		법인 등기비	400,000
4. 과총 지원금	**11,500,000**	교통비	100,000
국내 학술지	8,000,000	카드기 정보 변경비	50,000
국내 학술대회	3,500,000	이니시스 연관리비	220,000
		화환 및 근조기	500,000
		30주년 기념집	10,000,000
		예비비	500,000
5. 기타수입	**700,000**	**4. 학술대회**	**80,000,000**
이자수입	700,000	춘계학회	50,000,000
		추계학회	40,000,000
		5. 세금	**7,100,000**
6. 전기년도 이월금	**120,000,000**	재산세	400,000
적립금	50,000,000	법인세	500,000
이월금	70,000,000	부가세	4,000,000
		지방소득&주민세	200,000
		4대 보험료(기관 부담)	2,000,000
		6. 차년도 이월금(2019)	**129,000,000**
		적립금	50,000,000
		이월금	79,000,000
합계	323,400,000	합계	323,400,000

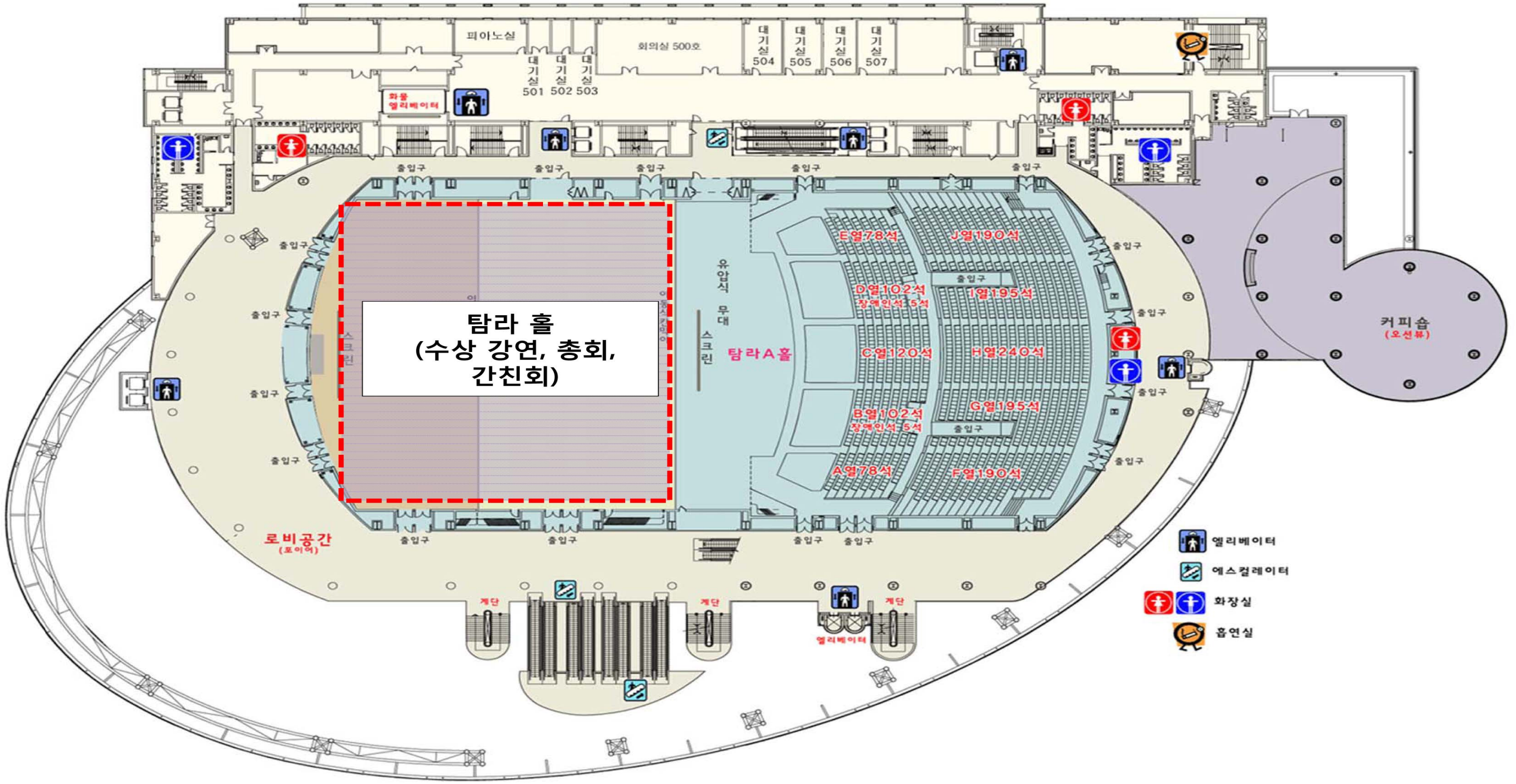
학술 발표회장 도면

ICC Jeju, 2F





ICC Jeju, 5F


피아노실
회의실 500호
대기실 501
대기실 502
대기실 503
대기실 504
대기실 505
대기실 506
대기실 507
화물 엘리베이터
출입구
탐라 홀
(수상 강연, 총회,
간친회)
스크린
유압식 무대
탐라A홀
E열78석
J열190석
D열102석
장애인석 5석
I열195석
C열120석
H열240석
B열102석
장애인석 5석
G열195석
A열78석
F열190석
커피숍
(오션뷰)
로비공간
(포이어)
계단
엘리베이터
엘리베이터
에스컬레이터
화장실
흡연실

(사)한국분석과학회 임원 명단

■ 명예 회장: 박긍식

■ 고문: 김만구, 김연제, 김영만, 김영상, 김원호, 김일광, 김택제, 문동철, 박만기, 박성우, 음철헌, 이 원, 이광우, 이광필, 이석근, 이종해, 최덕일, 하재호

■ 회장: 김태승

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■ 발전 동력 위원회: 김만구(위원장), 김인환, 김정현, 김효진, 노경원, 박용남, 손성건, 이덕희(부위원장), 이성희, 이중주, 이창선, 정민환

■ 사무총장: 황승율

■ 이 사:

강성호(학술), 강창희(학술), 공광훈(학술), 권성원(약학), 권오승(학술), 길효식(홍보), 김경섭(기획), 김기현(조직), 김상철(기획), 김원석(기획), 김윤석(홍보), 김종국(조직), 김태욱(재무), 김혁년(홍보), 김현주(조직), 김훈주(조직), 김희갑(환경), 남궁현(홍보), 민지숙(홍보), 박경수(조직), 박기홍(기획), 박준호(기획), 배선영(총무), 송준명(재무), 신익수(총무), 안욱성(학술), 안장혁(식품/농화학), 윤정기(학술), 윤혜온(학술), 이군택(홍보), 이성광(학술), 이원용(홍보), 이재형(총무), 이정미(기획), 이정애(기획), 이진숙(학술), 이창렬(홍보), 임흥빈(조직), 정세훈(기획), 정영림(학술), 조성찬(조직), 조재억(홍보), 최기환(총무), 최용욱(조직), 최은경(재료/섬유), 팽기정(기획), 한상범(조직), 한영지(학술), 한정희(홍보), 허수정(조직)

■ **편집위원회**

위 원 장: 홍종기

부위원장: 박종호

위 원: 강종성, 공광훈, 권오승, 김기현, 김병주, 김정권, 김주훈, 김희갑, 나동희, 류재정, 배선영, 양원호, 오정은, 오한빈, 이군택, 이성광, 이수연, 이정미, 임재민, 임흥빈, 장혜원, Bruce Gale, Georg Hempel, Lars Nilsson, Steve Williams, Thomas J. Schimidt

2017년 한국분석과학회 제59회 초록집

2017년 11월 01일 인쇄
2017년 11월 08일 발행

발행인: 김태승

편집인: 조남준, 황승율

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