KIST Europe has recently stepped into 'adulthood' as it reached its 20th year in 2016. Since 1996 in Saarbrücken, KIST Europe has accomplished the mission of establishing a bridge for joint research between high-technology research institutes in Europe and Korea. All members at KIST Europe, from different nationalities and various backgrounds, have accomplished the ultimate mission by extending their capabilities and expertise.
Dear Readers,

KIST Europe has recently stepped into ‘adulthood’ as it reached its 20th year in 2016. Since 1996 in Saarbrücken, KIST Europe has accomplished the mission of establishing a bridge for joint research between high technology research institutes in Europe and Korea. All members at KIST Europe, from different nationalities and various backgrounds, have accomplished the ultimate mission by extending their capabilities and expertise.

It is our pleasure to present our research activities and notable achievements in 2017. Our report will make evident our diverse collaborative efforts and specialized expertise in open and innovative research.

For any research institute or industrial organization currently searching for a competent partner for joint research, or for those planning to expand their business into Korean or European markets, KIST Europe is undoubtedly the most suitable collaboration partner to achieve their goals; it is our hope that you will recognize the significance of our role in science and technology partnerships between Korea and Europe.

I wish to acknowledge the consistent support and contribution from all of our collaboration partners, and to express my profound gratitude to the Saarland government and Saarland University for their enduring support and attention. I look forward to maintaining these partnerships to further expand our collaboration areas.

Finally, I wish to express my genuine appreciation for all members of KIST Europe for their notable efforts and contribution.

Sincerely,

Dr. Junkyung Kim
Director, KIST Europe
HISTORY

The only government supported research
institute in abroad with 21 years history

The official visit of the 14th Korean
President Kim, Youngsam to Germany
Both governments agreed on the establishment
of a Korean research institute organization
within PTG.

1995
March

1996
Feb

2000
April

2006
April

10th Anniversary

2010
April

2016
May

20th Anniversary

ORGANIZATION & EMPLOYEES

Foundation of KIST Europe
Role: Research on applied environmental &
strategic technologies and channel for national
cooperation
Classification of organization: Limited liability
company with 1 sole member (President of
KIST)

1st building completion
(providing 3,275 m² with 4 stories)
Facility: Laboratory, office, meeting room,
lecture and conference room

2nd building completion
(providing 2,068 m² with 3 stories)
Facility: 2 complex for office, Laboratory
Role: Providing facilities for local industries, academic institution and
research organisation

CONTACTS

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Head of Global Cooperation

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Vision

Becoming an Open Innovation Hub for R&D Collaboration and Industrial Activities

Strategies

Open Research

- Improve R&D Competence through Selective and Focused Strategy
- Develop platform technology for global environmental regulation compliance

Stimulate Joint R&D of Korea-EU

- Promote joint R&D of KIST and prominent research institutions in Korea with the EU (to allocate 35% of total R&D funds on joint R&D)

Industry Support

Support Korean Industry Activities in the EU

- Establish on-site technology centre, provide consultation for technology sourcing and organise an integrated partner network
- Support chemical regulation compliance for Korean chemical industry regarding REACH and REACH-like regulations

ADVISORY BOARD MEMBERS

Korean Members

Dr. Byung Gwon Lee (Chairman)
President, Korea Institute of Science and Technology

Dr. You Seung Kim
Former President of KIST, Korea Institute of Science and Technology

Dr. Myung Soo Kim
Former President of KRISS, Korea Research Institute of Standards and Science

Dr. lee Hwan Kim
Executive Deputy Chairman, Korea Industrial Technology Association (KOTRA)

German Members

Mr. Jürgen Lennartz
Head of Saarland State Chancellery

Prof. Dr. Manfred Schmitt
President, University of Saarland

Dr. Lothar Mennicken
Director of the Cooperation with Asia and Oceania Division, German Federal Ministry of Education and Research

Prof. Dr. Wolfgang Wahlster
President, German Research Centre for Artificial Intelligence (DFKI)

Prof. Dr. Andreas Schäffer
Director of Institute for Environmental Research RWTH Aachen

Prof. Dr. Rolf Müller
Managing Director, Saarland Institute for Pharmaceutical Research Saarland (IPS)
Research with PASSION
ENVIROMENTAL SAFETY

Objectives

Environmental Safety Group contributes to protection of human health and the environment from hazardous chemicals and mixtures of these chemicals, and to enhancing national competitiveness of chemical industry by fostering chemical trade and by ensuring high safety standards of the products.

R&D Areas

Alternative Toxicity & Ecotoxicity Assessments
- Investigation for the sources of origin and characterization of environmental pollutants and mixture
- Development of animal alternative test (AAT) system for chronic toxicity screening
- Development of environmental risk assessment tools and modeling

Computational Toxicology
- Prediction of mixture toxicity using advanced computer models
- In-Silico approaches as an animal alternative test (AAT)

Development of Metabolomics and its Application in Biomarker Discovery
- Targeted/pseudo-targeted metabolomics of chemicals
- Metabolomics in biomarker discovery
- Detection and quantification of metabolites and biomarkers

Journals


Implications of Pony Lake Fulvic Acid for the Aggregation and Dissolution of Oppositely Charged Surface-Coated Silver Nanoparticles and Their Ecotoxicological Effects on Daphnia magna

ABSTRACT

Citrate (C10) and polyethylenimine (BPEI)-coated silver nanoparticles (AgNPs) were used to understand how the type of capping agents and surface charge affect their colloidal stability, dissolution, and ecotoxicity in the absence/presence of Pony Lake Fulvic Acid (PLFA). In the presence of PLFA, cit-AgNPs were stabilized, while BPEI-AgNPs were aggregated. The aggregation of BPEI-AgNPs decreased with the time, and their stabilizing effect increased at high PLFA concentration. The dissolution also differed between both AgNPs and was influenced by the PLFA concentration. Generally, BPEI-AgNPs showed a lower amount of dissolved Ag than cit-AgNPs. The dissolved Ag concentration decreased for both AgNPs at low PLFA concentration (5 mL). In contrast, the extent of nanoparticle dissolution increased at high PLFA concentration (30 mL) but only for BPEI-AgNPs. In the absence of PLFA, the ecotoxicity of cit-AgNPs to Daphnia magna was higher than that of BPEI-AgNPs. However, the ecotoxicity of AgNPs in the presence of PLFA was up to 70% lower than in their absence.

We demonstrated that the differences in colloidal stability, dissolution, and ecotoxicity may be attributed to the different capping agents, surface charge, and concentration of natural organic matter (NOM) as well as to the formation of dissolved Ag complexes with NOM.

Youn Jung Jung,1,4 George Metreveli,1 Chang-Beom Park,1,5 Seungyun Baik,1,5 and Gabriele E. Schumann1

1Environmental Safety Group, Korea Institute of Science and Technology (KIST), Europe, Campus F 7.1, Saarbrücken 66123, Germany
2School of Environmental and Soil Chemistry, Institute for Environmental Sciences, University of Kookmin-Landau, Fortschrast 7, 68239 Landau, Germany
3Kangnam Department of Environmental and Soil Toxicology and Chemistry, Korea Institute of Toxicology, Gyeongsangnam-Do 52834, Republic of Korea

Figure 1. Mean hydrodynamic diameters (Dd) (A and C) and mean zeta potentials (Zeta) (B) and (D) of 2 mg/L C10-AgNPs and BPEI-AgNPs incubated in 10 mM NaNO3 solution in the absence and presence of 5 and 30 mg/L PLFA for 2 days. The error bars represent standard deviation of 3 replicates.

Figure 2. SEM images of 10 mg/mL BPEI-AgNPs in MIB-G water (A) and 1 mg/mL BPEI-AgNPs in the presence of 15 mg/mL PLFA (B). Energy Dispersive X-ray (EDX) analysis was carried at the postions of a and b in Figure 2B for the BPEI-AgNPs sample incubated in the presence of PLFA. The elemental compositions considered in this study are listed in Table 1.

Table 1. Elemental Compositions Detected in the Sample of BPEI-AgNPs Incubated with 10 mg/mL PLFA. Corresponding to Figure 2(B)

<table>
<thead>
<tr>
<th>Element</th>
<th>Weight (%)</th>
<th>Atomic %</th>
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</thead>
<tbody>
<tr>
<td>C</td>
<td>47.2</td>
<td>75.5</td>
</tr>
<tr>
<td>Ag</td>
<td>8.4</td>
<td>1.5</td>
</tr>
<tr>
<td>S</td>
<td>1.6</td>
<td>0.9</td>
</tr>
<tr>
<td>Si</td>
<td>30.5</td>
<td>20.9</td>
</tr>
<tr>
<td>Na</td>
<td>12.3</td>
<td>1.2</td>
</tr>
</tbody>
</table>

MAJOR ACHIEVEMENT

A Decellularized Matrix Produced by Mesenchymal Stem Cells Modulates Growth and Metabolic Activity of Hepatic Cell Cluster

Joo-yeon Park,1,5 Joyeon Kim,2,5 Kathryn Michele Sullivan,2 Seungyun Baik,1,5 Eunkyung Ko,2 Myung-Joo Kim,5 Young Jun Kim,4 Hyun-Jong Kong1,5,6

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4Environmental Safety Group, Korea Institute of Science and Technology (KIST), Europe, Campus F 7.1, Saarbrücken 66123, Germany
5Department of Prosthodontics and Dental Research Institute, School of Dentistry, Seoul National University, Seoul 110-749, Korea
6Carl L. Wasse Institute for Genomic Biology, University of Illinois at Urbana-Champaign, Urbana, IL 61801, USA

Figure 1. Schematic description of the process to prepare decellularized matrices of mesenchymal stem cells (MSCs). (a) After culture on a cell culture flask at confluency over 3 days, MSCs were decellularized and incubated in the water-saturated mixture for decellularization. (b) MSCs spheroids assembled using the hanging drop method were incubated in the water-saturated mixture for decellularization.

Figure 2. Scanning electron microscopy images of decellularized matrices (a) decellularized matrix formed by MSCs cultured on the 2D substrate (b) Decellularized matrix of MSC spheroids. (c) The dotted line represents the boundary of a pore and white arrow represent the fibrous matrix.

Figure 3. Chromatograms for samples run with LC/MS/MS for each mode. (a) Liver peak chromatograms (PRK) in 40 min of running. (b) Sarcophagus chromatograms (GC) from the major peak (1) (c) Extracted ion chromatograms (EIC) from the major peak (2). For all chromatograms, black line and red line indicated median lines, the decellularized matrix of single MSCs and the decellularized matrix of MSC spheroids, respectively. Flanges beyond retention time selected (3), retention time between 20 and 40 minutes, was neglected for EIC due to extension of some peaks from medium blank.
BIOSENSOR AND MATERIALS

Objectives

The group studies multidisciplinary researches based on MEMS, Microfluidics, Chemistry, Biology, Magnetics and Material science, etc.

The group consists of 3 laboratories such as Biosensor and Microfluidics Lab., Magnetic Materials Lab., and Energy Transformation and Storage Laboratory developing core technologies of various sensor including microfluidic platforms, advanced electrochemical systems as well as magnetic micro- and nano materials for applications to the alternative animal tests and the smart sensor/energy systems.

R&D Areas

Biosensor and Microfluidics
- Ultra high efficient capillary electrophoresis
- Enzyme-based bio sensor
- Organ on a chip and Biomimetic microfluidics
- High sensitive microfluidic sensor platform using FFTP pre-concentration
- Electro-Chemical Luminescent sensor system

Magnetic Materials
- Microfabricated magnetic elements and self-assembly
- Nanofabricated magnetic particles as alternative to colloid particles
- Novel functional materials based on magnetic interaction
- Magnetic bacteria and bacteriophages
- Magnetically control of micro-organisms for drug delivery, environmental sensing and elimination of toxic compounds
- Biomimetics on viruses and inside bacteria and novel functional materials

Electrochemical Energy Transformation & Storage
- High temperature PEM fuel cell
- Redox flow batteries
- All-vanadium redox flow battery
- Hydrotic ionic liquids as supporting salts
- Organic compounds as redox active species

Journals

Yuliya E. Silina, Jennifer R. Tillotson, Andreas Manz, "Storage and controlled release of fragrances maintaining a constant ratio of volatile compounds", RSC Analytical Methods, 9, 6073-6082


Wenning Wu, Andreas Manz, "Biocompatibility assay of cellular behavior inside leaf-inspired biomimetic microdevice at single cell level", RSC Advances, 7, 32710-32720

Xiangping Li, Wenning Wu, Andreas Manz, "Thermal gradient for fluorometric optimization of droplet PCR in virtual reaction chambers", Microchimica Acta, 184, 3433-3439

Neha Agarwal, Hyobong Ryu, Melanie Mangang, Wilhelm Pfleging, Jungtae Kim, "Direct writing of a conducting polymer pattern in aqueous solution by using an ultrashort laser pulse", RSC Advances, 7, 38663-38669

Jeroen de Vries, Thijs Boelhuis, Leon Abelmann, "Temperature dependence of the energy barrier and switching field of sub-micron magnetic islands with perpendicular anisotropy", JPD New Journal of Physics, 19, 093019

Lijun Pan, Bum Chul Park, Micheal Ledwig, Leon Abelmann, Young Keun Kim, "Magnetic Particle Spectrometry of Fe 3 O 4 Multi-Granule Nanocusters", IEEE transactions on magnetics, 53, 1-4

M Dirnberger, K Mehlhorn and T Mehlhorn, "Introducing the slime mold graph repository", Journal of Physics D: Applied Physics, 50, 264001

Zhenjun Chang, Dirk Henkensmeier, Ruiyong Chen, "One-Step Cationic Grafting of 4-Hydroxy-TEMPO and its Application in a Hybrid Redox Flow Battery with a Crosslinked PBI Membrane", ChemSusChem, 10, 1-6

Hui Zhang, Chengyu Mao, Jianlin Li, Ruiyong Chen, "Advances in electrode materials for Li-based rechargeable batteries", RSC Advances, 7, 33589

BIOSENSOR AND MATERIALS

Van de Graaff generator for capillary electrophoresis

Seung Jae Lee, Eric R. Castro, Rosanne M. Guili, Mark D. Tarn, Andreas Manz

ABSTRACT

A new approach for high voltage capillary electrophoresis (CE) is proposed, which replaces the standard high voltage power supply with a Van de Graaff generator, a low current power source. Because the Van de Graaff generator is a current-limited source (10 μA), potentials exceeding 100 kV can be generated for CE when the electrical resistance of the capillary is maximized. This was achieved by decreasing the capillary diameter and reducing the buffer ionic strength. Using 2 mM borate buffer and a 5 μm i.d. capillary, fluorescently labeled amino acids were separated with efficiencies up to 3.5 million plates; a 5.7 fold improvement in separation efficiency compared to a normal power supply (NPS) typically used in CE.

This separation efficiency was realized using a simple set-up without significant Joule heating, making the Van de Graaff generator a promising alternative for applying the high potentials required for enhancing resolution in the separation and analysis of highly complex samples, for example mixtures of glycans.

Fig. 1. Experimental setup of a Van de Graaff (VdG) generator for capillary electrophoresis
(A) Schematic diagram of the platform, illustrating a capillary tube inserted into the sample or background electrolyte (BGE) reservoir connected to a "normal" DC power supply (NPS) at the capillary inlet, and to a 5 kV reservoir connected in the VdG at the capillary outlet. The operating principle of the VdG is illustrated on the right, in which a moving rubber bell generates a regular negative charge that is collected at the capillary. Sample injection was achieved electrosokastically using the NPS, in order to measure the electric field strength generated by the VdG, an electric field meter was placed 140 mm away from the dome.
(B) For sample injection, the capillary and electrode connection to the NPS for electrosokastic sample injection were temporarily moved to the sample and buffer reservoirs for 3 s. After this, the grounded electrode and capillary were moved back to the buffer reservoir.
(C) The capillary was assembled to a microinjection system, connected to an optical fiber for laser-induced fluorescence (LIF) detection near to the outlet of the capillary. The outlet of the capillary was inserted into a stainless steel buffer reservoir that was electrically connected to the VdG via a platinum wire.

Fig. 2. Structure of Nafion and the cluster-network model: hydrophilic/hydrophobic clusters connected by short nanowires between side chains, and dyes sulfonic acid groups (DS) [2] .

Fig. 3. Membrane preparation in a pre-irradiation grafting process. (A) Aminated (EPD) film/polymer (polymer for nonconductive) membranes were obtained via irradiation of electron beam irradiation, grafting of amino groups on the surface of carbon, and crosslinking. Under the amino conditions, the amino groups are probably in protonated, positively charged form.

Fig. 4. Only the Pd(II) ion is detected by LIF while other LIF-compatible cations are not detected by LIF.

Fig. 5. (A) and (B) Cross-sectional SEM images of a CMSCE membrane retained for the LIF detection of cationic species. (A) Dependence of the efficiencies on the current densities, and (B) cycling test at 130mA cm-2.

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MAJOR ACHIEVEMENT REVIEW

Redox Flow Batteries for Energy Storage: A Technology Review

Ruijie Ye, Dirk Henkensmei, Sang Jun Yoon, Zhaifei Huang, Dong Kyu Kim, Zhenjun Chang, Sangwon Kim, Ruyong Chen

ABSTRACT

The utilization of intermittent renewable energy sources needs low-cost, reliable energy storage systems in the future. Among various electrochemical energy storage systems, redox flow batteries (RBs) are promising with merits of independent energy storage and power generation capability, localizability, flexibility, high efficiency, low scale-up cost, and excellent long charge/discharge cycle life. RBs typically use metal ions as reacting species. The most exploited types are all-vanadium RBs (VRBs). Here, we discuss the core components for the VRBs, including the development and application of different types of membranes, electrode materials, and stack system. In addition, we introduce the recent progress in the discovery of novel electrolytes, such as redox-active organic compounds, polymers, and organic/inorganic suspensions. Versatile structures, tunable properties, and abundant resources of organic-based electrolytes make them suitable for cost-effective stationary applications. With the active species in solid form, suspension electrolytes are expected to provide enhanced volumetric energy densities.

Fig. 2. Structure of Nafion and the cluster-network model: hydrophilic/hydrophobic clusters connected by short nanowires between side chains, and dyes sulfonic acid groups (DS) [2].

Fig. 3. Membrane preparation in a pre-irradiation grafting process. (A) Aminated (EPD) film/polymer (polymer for nonconductive) membranes were obtained via irradiation of electron beam irradiation, grafting of amino groups on the surface of carbon, and crosslinking. Under the amino conditions, the amino groups are probably in protonated, positively charged form.

Fig. 4. Only the Pd(II) ion is detected by LIF while other LIF-compatible cations are not detected by LIF.

Fig. 5. (A) and (B) Cross-sectional SEM images of a CMSCE membrane retained for the LIF detection of cationic species. (A) Dependence of the efficiencies on the current densities, and (B) cycling test at 130mA cm-2.

(Reproduced with permission from Joule et al. [14]. Copyright 2015 by Wiley)
SMART CONVERGENCE

Objectives
Smart convergence group contributes to novel smart applications and its enabling technologies. Currently, we develop the key solutions for smart factories with Korean and German partners. Next step will be the extended application of the key solutions to various Internet of Things solutions and services such as smart healthcare and smart city.

R&D Areas
Future Applications and Services
- Novel smart service scenarios
- Development of mobile and web applications

Data Analysis
- Research on data collection, processing and data mining
- Development of machine learning algorithms that enable smart services

Software development and global testbed
- Development of control and monitoring systems
- Global collaboration testbed in Industry 4.0

Proceedings

Oral Presentation
Höster, M., "IBM Industrie 4.0 SPSS Analytics: Getting Started Exercise", in 2nd BMWi Big Data All Hands Meeting and 2nd Smart Data Innovation Conference, Karlsruhe (2017)
Hwang, J., "4th Industrial revolution, AI and KIST Europe", invited talk in TTA, Seongnam-si (2017)
Hwang, J., "4th Industrial revolution, AI and Industrial Impact", invited talk in KBA annual meeting, Paris (2017)

Collaboration Activities
Member of SmartFactoryKL AG2
- Development of cloud predictive maintenance by using data analytics
- ETRI-KIST Europe Joint Research Lab
- Development of interoperability operation between ETRI’s CPPS system and German RAMI 4.0 model
- Partner of Software Cluster
- Official partner institution of software cluster
- Kyung Hee University-KIST Europe Joint Research Lab
- Personal exchange & training program, Joint Research Planning
- MoU agreement with GST
- Collaboration in the field of artificial intelligence

Current Projects
ATC Global Convergence Program
- Development of IoT monitoring system supporting an automatic packaging machine of ACE machinery
- Connected Smart Factory Program
- Development of a smart manufacturing system test-bed based on CPPS middleware and trial of its interoperability with smart factory test-bed of EU/Germany

Korea Institute of Science and Technology Europe
Application of deep neural network and generative adversarial network to industrial maintenance: A case study of induction motor fault

Lee, Y. O., Jo, J., & Hwang, J.

ABSTRACT

As data visibility in factories has increased with the deployment of sensors, data-driven maintenance has become popular in industries. Machine learning has been a promising tool for fault detection, but the problem is that the amount of fault data is much less than that of normal data which causes a data imbalance. In this study, we designed a deep neural network for fault detection and diagnosis, and compared the oversampling by a generative adversarial network to standard oversampling techniques. Simulation results indicate that oversampling by the generative adversarial network performs well under the given condition and the deep neural network designed is capable of classifying the faults of an induction motor with high accuracy.

INTRODUCTION

Industry 4.0 has transformed the manufacturing environment. As data visibility in factories has increased with the deployment of sensors, decision making such as planning, control and maintenance has shifted to data-driven strategies. Among these strategies, maintenance efficiency is expected to improve with optimized maintenance activities [1].

Data-driven maintenance is an advanced methodology for monitoring the condition of machines and equipment in order to analyze and determine the best time for maintenance activities. Data-driven maintenance is more economically efficient than traditional maintenance methods like time-based maintenance. It promotes higher system reliability by allowing for the components of a machine to be used for the extended life span and by repairing and replacing components before actual breakdowns occur and cause other more expensive problems [2].

Fig. 1 Test bench (model: EMD-FKKE2100LA, Pmene: 3 kW, rpm: 1440/min, voltage: 400V, from: 0.4A, cosβ: 0.78)

Fig. 2 Normal rotor fault and bearing fault signals, respectively

Fig. 3 Comparison between a normal and fault condition in EMD

Fig. 4 Concept of data preparation, oversampling and fault detection

Fig. 5 Experimental results of no sampling

Fig. 6 Experimental results of sampling
Global Cooperation for the FUTURE
**KOREA-EU STRATEGIC NETWORKING**

**Hosting of 2017 Korea-EU Innovation Academy 2017**

**Date/Place**
November 5th~15th, 2017 / Germany and Switzerland

**Host Institutes**
1. KID (Korea Institute of Resources Development in Science and Technology) KIST Europe
2. Fraunhofer IAO, Germany
3. Fraunhofer IAF, Germany
4. Eurocluster, Switzerland
5. ZURICH TECHNO Park, Switzerland

**Main Organiser**
KIST (Korea Institute of Science and Technology)

**Co-organiser**
1. KSSA (Korean Society for Science and Technology in Europe)
2. KASEA (Korean Academy of Engineering)
3. KOSAI (Korean Society for AI)
4. KOREA
5. KIST

**Topic**
- 4th Industrial Revolution Policy and Paradigm Shift in Science and Technology Sector
- Development of Friendship among Korean scientists in Europe
- Cultivation of Joint Research Capacity

**Participants**
Approx. 650 scientists (KIST Europe Scientists : 17)

---

**Participation in the EKC 2017**

**Date/Place**
July 26th~29th, 2017 / Stockholm, Sweden

**Main Organiser**
KSSA (Korean Society for Science and Technology in Europe)

**Co-organiser**
KOREA
KIST
KSSA
KASEA
KOSAI
KOREA
KIST

**Topic**
- Exchange useful Knowledge and bright ideas for the promotion of Science and Technology in service of the human being and the society
- Development of Friendship among Korean scientists in Europe

**Details**
Participation in Oral presentation and Poster session

**Participants**
Approx. 650 scientists (KIST Europe Scientists : 17)

---

**Participation in the 3rd BIKIE Symposium at University of London**

**Date/Place**
September 16th-17th, 2017 / London, UK

**Topic**
BIKIE: Bio Korea in Europe
- Participation in Presentation Session
- Development of internal networking between Korean scientists in the field of biological science in Europe

**Details**
Presentation on Theme Bio-materials, Toxicity and Prediction (Dr. Jong Woon Kim, Young Jun Kim, Prof. Dr. Leon Abelmann)

**Participants**
Approx. 60 scientists (KIST Europe Scientists : 8)
ACTIVITIES WITH EUROPEAN ORGANIZATIONS

Registration as a partner in the German Software-Cluster

Overview of the Software-Cluster
(Funded by the German Federal Ministry of Education & Research)
- Main Function: Joint Research, Networking, Education and Training in the area of software development and 4th industrial revolution
- Cluster Region: Southwest of Germany around the cities of Darmstadt.

Registration Date: March 16th, 2017 (Verification Period: Jan-Mar 2017)
Cooperation organizations: Approx. 11,000 such as Fraunhofer, DFKI, SAP, University of Saarland etc.

KIST Europe-University of Saarland "TSE Center" Opening Ceremony
Date/Place: April 24th, 2017 / Saarbrücken
Name of Center: Transfercentre Sustainable Electrochemistry
Brief History:
- 1997. 7 / 2006. 4: Agreement on Scientific and Technological Cooperation between KIST Europe and University of Saarland
- 2015. 3: Joint Electrochemistry Lab Opening in KIST Europe
- 2016. 10: Agreement on Establishmeni TSE

Participants:
- KIST Europe: Dr. Kuwon Choi, Dr. Sangwoon Kim
- University of Saarland: Prof. Dr. Manfred Schmitt (President)
  Prof. Rolf Pelster (Faculty: Physics)
  Prof. Dr. Rolf Hempelmann (Faculty: Chemistry)

Ursapharm On-site Lab Opening Ceremony
Date/Place: April 28th, 2017 / KIST Europe
Full Name of Lab: Innovative Product Development Laboratory
- Ursapharm Company
  - Consistent Transfer of innovative pharmaceutical conceptions into successful medicine and medicinal products
  - International medium-sized company in the field of ophthalmology
Purpose:
- Joint research & Development of new Product
- Planning of commercialization

Hosting of the 1st Korea-Germany Environmental Workshop
Date/Place: October 12th-13th, 2017 / Korean Embassy in Bonn, Germany
Co-Host Organizations:
Korean Embassy in Bonn, VeKNI, KEIT

Theme: Efficient ways to improve air quality
Participants: 40 Korean-German Experts in the field of Environmental issues

ACTIVITIES WITH KOREAN ORGANIZATIONS

KIST Europe-Kyung Hee University Joint Research Lab Opening Ceremony
Date/Place: July 24th, 2017 / KIST Europe
Name of Laboratory:
KHU-KIST Europe Joint Research Lab.
Participants:
- KIST Europe: Dr. Kuwon Choi, Heung-Nam Kim, Jangwoon Hwang, Jeongho Seo
  KHU Computer Engineering Faculty: Dr. Jinsung Cho, Dr. Young Koo Lee, Dr. Sungwan Lee

KIST Europe-KIT Joint Research Center Opening Ceremony
Date/Place: September 5th, 2017 / KIST Europe
Name of Center: Joint Research Center for Alternative & Predictive Toxicology (ARC-APT)
Participants:
- KIST Europe: Dr. Kuwon Choi, Heung-Nam Kim, Jungtae Kim, Sanghyun Kim, Youngjun Kim, Hyon-Pyo Jeong, Seungyung Baik
  KITEC: Dr. Mungho Jung (Director), Dr. Seokju Yoon, Dr. Juwoon Park

Participation in the 18th Innovative Technology Show
Date/Place: September 14th-16th, 2017 / Seoul, Korea
Activities:
- Running KIST Europe Booth and consulting Small and medium sized enterprises to extend business areas into Europe
- Attending with the gwSaar (Saarland Economic Promotion Corporation)

Participation in 2017 VeKNI Annual Committee
Date/Place: October 22nd-23rd, 2017 / Essen, Germany
Topic:
- Seminar Session and Networking, Presentation on KIST Europe
- Korean Governments R&D Investment Direction
  - R&D Project Planning on Industrial Technology
### GUESTS AT KIST EUROPE

**Overview**

- **Total Number of Guests**: 274 Persons
- Most of guests had more obvious objective, such as Joint Research, Project Planning and MoU (266/274)
- Especially, in 2017, many guests had great interest in 4th Industrial Revolution Theme (113/274)
- 36% of guests were from GSR (Government-Supported Research Institute)

#### Table 1. Classification according to guest organization

<table>
<thead>
<tr>
<th>Type of Organization</th>
<th>Number of Visitors</th>
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<td>Public Office</td>
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<tr>
<td>Public Institution</td>
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</tr>
<tr>
<td>Korean University</td>
<td>47</td>
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<tr>
<td>Foreign University</td>
<td>5</td>
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<tr>
<td>Company</td>
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<tr>
<td>Press</td>
<td>2</td>
</tr>
<tr>
<td><strong>Sum</strong></td>
<td><strong>274</strong></td>
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</table>

#### Table 2. Classification according to visiting department

<table>
<thead>
<tr>
<th>Visiting Department</th>
<th>Number of Visitors</th>
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### Achievements 2017

#### (1) In-Cosmetic Workshop
- **Date/Place**: April 5th, 2017 / London, UK
- **Purpose**: Compliance to the current EU Environmental regulation for cosmetic ingredients companies and the EU Cosmetic Regulations for Korean cosmetic companies

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#### (2) K-REACH and K-BPR Infoday
- **Date/Place**: April 27th, 2017 / Cologne, Germany
- **Purpose**: Advise European Companies of the revised K-REACH and K-BPR regulation—the new chemical legislation

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#### (3) K-REACH and K-BPR Infoday
- **Date/Place**: June 21st, 2017 / Seoul, Korea
- **Purpose**: Explanation and consulting EU-REACH and EU Cosmetic Regulations for the Korean cosmetic ingredients manufacturer and related companies

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**Workshop for the Planning of KIST Europe’s long-term vision**

#### Date/Place: February 22nd-24th, 2017 / KIST Europe

**Purpose**: Discussion about Management and Research Sector

<table>
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<th>Schedule</th>
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<td>22-Feb</td>
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<td>Visit the EFU SmartFactory Consortium</td>
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<td>24-Feb</td>
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</tbody>
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**Visit of the delegation from MSIP with the 2nd Vice Minister**

- **Date**: April 27th-29th, 2017
- **Topic**: Report on KIST Europe long-term Vision Presentation
  - Visiting of neighbor institutions (TSE, DPK, and HIPS)
  - Participation of the opening ceremony of Ursapharm
  - On-site Lab
- **Delegation**: Dr. Sang Chun Lee (KIST President), Mr. Ick Chan Lee, Ms. Ji-Sun Ahn

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**Visit of the President of KIST Seoul**

- **Date**: July 21st-23rd, 2017
- **Topic**: Report on KIST Europe long-term Vision Presentation
  - Discussion on ongoing research themes with Senior Researchers

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COOPERATION AGREEMENTS

MoU between KIST Europe – Kyung Hee University-Industry Cooperation Foundation
Date/Place: February 6th, 2017 / Seoul, Korea
Contents:
- Establishment of the laboratory for academic research cooperation
- Offering internship programs for human resource development
- Promotion of Joint research collaboration

MoU between KIST Europe – Gwangju Institute of Science and Technology (GIST)
Date/Place: August 28th, 2017 / KIST Europe
Cooperation Field: Exchange of Members and Research Collaboration
Visitors: Dr. Seung-Hyeon Moon (President), Mr. Moon-Gu Jeon, Mr. Young Chul Kim, Ms. Soo Jeong Park

MoU between KIST Europe – School of Organic and Mineral Chemistry (ESCOM)
Date/Place: February 16th, 2017 / ESCOM, France
Contents:
- Exchange and training of faculty members, staffs, students
- Exchange of academic materials and publications
- Identification of further collaborative activities
Details: ESCOM Student’s Participation in the KIST Europe Research Project: Electrochemical Energy Transformation and Energy Storage

MoU between KIST Europe – QJeong Eco-Resilience Institute
Date/Place: September 18th, 2017 / Seoul, Korea
Cooperation Field:
- Environmental Safety and Climate Change
- Staff interactions
- Education, outreach, and professional development

MoU between KIST Europe – Hanyang University – University of Saarland
Date/Place: October 19th, 2017 / Saarbrücken, Germany
Contents:
- Initiating a joint degree program and conducting joint research activities
- Exchange of faculty members, researchers and staffs, graduate students
- Exchange of information and academic publications
- Holding lectures and symposia
- MoU between Faculty/Group of each party
  - KIST Europe: Biobond & Matins Group
  - Hanyang University: Department of Energy Engineering
  - University of Saarland: Natural Science and Technology Faculty

Agreement between KIST Europe Environmental Safety Group – KRICT Center for Chemical Analysis
Date: July 10th, 2017
Contents: Agreement for Cooperation in the field of Analysis on the EU REACH and K-REACH EU-REACH
LOCATION OF KIST EUROPE

From Frankfurt Airport:
By train directly from Frankfurt Airport Station to Saarbrücken Main Station by fast train (ICE/IC) or local train (RE/RB). For more information, see: www.bahn.de (English version available)

Information for the navigation system:
Stuhisatzhausweg 97
66123 Saarbrücken, Germany
GPS Coordinates: N 49°15’ 32.0”E 07°02’ 25.4”