Greeting;

Already 4 years have passed, since KANEKA/SKKU Incubation Center has been established on July 1st 2010 on the base of Japanese chemical company; Kaneka Corporation's full financial support.

As you may know, Japan has long history in industry and tradition to develop excellent basic technologies, as Kaneka has represented. And in Korea, there are dynamism and good technologies for nano-materials and devices and also excellent global companies behind us such as Samsung, LG etc. Fusion of these two powers must be great influence to the market in the world. The Incubation Center will play an important role to make a bridge between Japan and Korea.

So far, KANEKA/SKKU International Symposium were held three times at SungKyunKwan university(SKKU) with very outstanding professors and scholars; such as Prof. Hideki Shirakawa; Novel laureate in 2000 etc. This year, we have also invited very famous scholars and engineers from Japan and Korea as shown in this program. They are usually so busy and it is hard to hear their seminars. I would very much appreciate them to come to SKKU and give us wonderful lectures.

Finally, I hope all of you to enjoy their seminars and discussions, as before.

Thanks.

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Program

Chair person :

09:30 Opening

09:45 Masuo Aizawa (Tokyo Inst. of Tech., Former President)
"S & T and Innovation Initiatives for Shaping the Future"

10:30 Do Chul Choi (Samsung Elec., Senior Vice President)
"Korean Alphabet's Surprising Impact on Korean IT Industry"

11:10 Break

Chair person :

11:25 Hideo Hosono (Tokyo Inst. of Tech.)
"Issues of Oxide TFTs for OLED Applications"

12:10 Lunch

Chair person :

13:40 Soo Young Park (Seoul National Univ.)
"Novel Strategies and Materials for Photo-induced Fluorescence Switching"

14:20 Masami Nakamoto (Osaka Municipal tech. Res.Inst.)
"Nanoparticles and Nanoink for Fine Pattern Formation : Evolution of Nanoink from Silver to Copper"

15:00 Chang Sik Ha (Pusan National Univ.)
"Thermally Stable Polymers for Flexible Substrates"

15:40 Break

Chair person :

15:55 Yasuteru Urano (Tokyo Univ.)
"Novel spirocyclization-based "activatable" fluorescence probes: From in vivo imaging of tiny tumors to super-resolution imaging"

16:35 Jae Hyung Park (Sungkyunkwan Univ.)
"Stimuli-Sensitive Polymeric Nanoparticles for Cancer Therapy and Imaging"

17:15 Closing

17:30 Reception

S & T and Innovation Initiatives for Shaping the Future

Prof. Masuo Aizawa

Counselor to the President, Japan S&T Agency (JST),
Former Executive Member, Council for S&T Policy (CSTP),
Cabinet Office,
Former President, Tokyo Institute of Technology

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It is the historical moment that Asia is dramatically transforming in S&T research and innovation-driven growth. The Asian share of S&T article production increases significantly as China, Japan, and Korea hold 12.0%, 6.6%, and 3.0%, respectively in 2013. More importantly, international collaboration becomes the norm rather than fiercer competition. Most strikingly, Asian share of the world GDP is predicted to exceed more than half by 2030. To thrive in the transforming times, we are enforced to pursuit Global Excellence in S&T and Innovation that attract the world. Priority should be set on creation of Quantum-leap Knowledge in Basic Research and Disruptive (Breakthrough) Innovation rather than Incremental.

For pursuing Global Excellence, the World Premier International Research Initiative (WPI) and the Funding Program for Innovative R&D and S&T (FIRST) have been promoted under government funding with successful accomplishments. Issue-driven Innovation Initiatives are also programed under government support to address the global/regional challenges of energy/environment and health/medicine through Cross-Ministry Partnership and Industry/University Collaboration. The whole S&T and Innovation Initiatives are overviewed with the future perspectives.

Dr. Masuo Aizawa currently serves as Counselor to the President, Japan Science and Technology Agency (JST), being entitled Professor Emeritus of Tokyo Institute of Technology. He was Executive Member, Council for Science and Technology Policy (CSTP), Cabinet Office in 2007-2013 and Member, Intellectual Property Strategy Office, Cabinet Secretariat in 2007-2013.

He earned his B. Eng. from Yokohama National University and Dr. Eng. from Tokyo Institute of Technology in 1971. He was Assistant Professor of Tokyo Institute of Technology in 1971-1980, Research Fellow of Lehigh University in 1974-1975, and Associate Professor of Tsukuba University in 1980-1986. He joined Tokyo Institute of Technology as Professor in 1986. He was appointed as Dean of School of Bioscience and Biotechnology, Tokyo Institute of Technology, in 1994-1996 and 1998-2000, and Vice President in 2000-2001. He was President of Tokyo Institute of Technology in 2001-2007.

He served as President of Japan Association of National Universities (JANU), Chair of Council for University Accreditation, and Member of Central Council for Education (Chair of University Division). He was Member of Science Council of Japan, Vice President of Chemical Society of Japan, President of Electrochemical Society of Japan, President of International Society of Molecular Electronics and Biocomputing, and President of International Society for Bioluminescence and Chemiluminescence.

He is the recipient of the Chemical Society of Japan Award, the Electrochemical Society of Japan Award, Outstanding Award of the Electrochemical Society, International Chemical Sensor Award, and others. He was decorated by the Medal with Purple Ribbon in 2005.

Korean Alphabet's Surprising Impact on Korean IT Industry

Dr. Do Chul Choi

Senior Vice President, Ph. D.
Global Business and Technology Strategy
Digital Appliances Business
Samsung Electronics Co., LTD., Korea

E-mail : d12.choi@samsung.com

Last couple of decades, Korean information technology industry has exploded rapidly. Korea becomes one of the largest manufacturing countries of cell phones, TV's and other critical components for these devices. Naturally, this rapid growth is due to very high market penetration of digital IT consumer products and advanced IT infrastructures.

Number of Korean alphabets is 24 : 14 consonants and 10 vowels. These characters are combined together into syllable blocks. But if you look at the character structure, Korean alphabets are based on only 6 basic consonants, g/k, n, s, m, l and ng, and 3 basic vowels, heaven (a dot, 天), earth (a horizontal line, 地) and man (a vertical line, 人). These 9 basic characters are cleverly combined to make the official 24 characters. The presentation talks about how this simplicity of the Korean alphabets makes Korean consumers adapt word processing on personal computers and text messaging on cell phones surprisingly early considering poor economic status.

The presenter assumes that Korean alphabetic system, a unique invention by one king, is one of important reasons for the Korean IT miracle. Easy applications of Korean alphabets (Hoon Min Jung Em, 訓民正音) to digital computing systems will be discussed. This may explain the reason why Korean become early IT consumer, consequently has helped Korean IT industries.

Dr. Do Chul Choi, a senior vice president in Samsung Electronics, is currently in charge of global business and technology strategy. He is overseeing the business opportunities and product development for main business segments such as air conditioners, refrigerators, washing machines, cooking ranges and vacuum cleaners. He also leads various exploration activities to achieve quantum business growth through innovations and new technologies.

Dr. Choi also oversees all foreign government affairs, global standardization and regulatory activities as well as trade association activities for the business division. He is a Chairman of Major Appliance Division in AHAM (Association of Home Appliance Manufacturers in USA) and a Steering Committee Member of CECED (European Committee of Domestic Equipment Manufacturers).

Prior to his current position, he was the head of Samsung Home Appliance Research Center, and Chief Technology Officer of Digital Appliances Business Division. He was responsible for global product development activities, business development, and also commercialization of appliances and core components for the division.

Before joining Samsung in 2004, he was with United Technologies Research Center as a Research Fellow. During his UTC tenure, he was nominated as a MIT Industrial fellow.

He was with AVCO Research Laboratory, TEXTRON, as a Principal Research Scientist. Before coming to the US for the graduate study, he was a Senior Research Scientist in Korea Atomic Energy Research Institute in Seoul, Korea.

He earned his PhD and MS degrees in Mechanical Engineering from the Pennsylvania State University in State College, Pennsylvania.

Issues of Oxide TFTs for OLED Applications

Prof. Hideo Hosono

Director of Materials Research Center for Element Strategy&Professor at Frontier Research Center, Tokyo Institute of Technology

E-mail : hosono@msl.titech.ac.jp

Oxide TFTs represented by amorphous IGZO have large mobility and can be fabricated at low temperatures. These features make oxide TFTs favorable as the backplane to drive OLEDs. However, there remain several materials issues to be resolved when a-IGZO-TFT is applied to OLEDS in place of p-LTPS-TFTs.

In this presentation, I will talk about this issue after the general features and current status of oxide TFTs are introduced.

Dr. Hideo Hosono was born in 1953 at Saitama Prefecture, JAPAN and received his B.Eng, Master of Eng. and obtained Ph.D at 1982 in Applied Chemistry all from Tokyo Metropolitan University. He became assistant professor (1982) and associate professor (1990) at Department of Inorganic Materials, Nagoya Institute of Technology, and then moved to Tokyo Institute of Technology as an associate professor. After 2-years appointment as associate Professor at Institute for Molecular Science, Okazaki, he was promoted to Professor of Functional Ceramics Division at Materials and Structures Laboratory (MSL), Tokyo Tech. He moved to Frontier Research Center, Tokyo Tech, from October, 2004, keeping the position at MSL and was appointed the director of Materials Research Center for Element Strategy on August 1, 2012.

Professor Hosono has served as many international journals, i.e., regional editors of Journal of Non-Crystalline Solids (1993~), Science and Technology of Advanced Materials (2011~), Editorial Board Members of Solid State Communications (2010~), Superconductor Science and Technology (2010~) and Crystals (2010~) and the International advisory board member of Applied Physics Express (2009~). He is a fellow of American Ceramic Society, Japanese Society of Applied Physics and a Member of World Academy of Ceramics.

He published ~900 original research papers in SCI journals. The total citation is ~32,000 and h-index is 75.

In particular, his paper reporting a new superconductor LaFeAsO1-xFx with Tc=26K in Journal American Chemical Society was the most cited paper published in 2008.

Dr.Hosono received the 1st Otto-Schott Research Award (Ernst-Abbe Foundation, Germany, 1990), the W.H.Zachariasen Award(1995), Bernd Matthias Prize for Superconductivity (2009), Asahi Award (2011), Research Achievement Award (Applied Physics Society of Japan, 2011), Jan Rajchman Prize (Society for Information Displays, 2011), Nishina Memorial Award (2012) , The Japan , Chemical Society Award (2012), Thompson Reuter Citation Laureate(2013) and so on.

He is a member of Science Council of Japan (2011-), fellow of American Ceramic Society and Japanese Applied Physics Society and an academician of world academy of ceramics, and board of director of MRS

Novel Strategies and Materials for Photo-induced Fluorescence Switching

Prof. Soo Young Park

Department of Materials Science and Engineering
Seoul National University
Center for Supramolecular Optoelectronic Materials
(Director of CRI program of Korea)
Korean Academy of Science and Technology (Fellow)

E-mail : parksy@snu.ac.kr
Home page: http://csom.snu.ac.kr

In this presentation I will talk about molecular design strategies for highly fluorescent and photo-switchable organic molecules, nanoparticles, nanowires, gels, and polymer films. Highly efficient photochromic switch composed of diarylethene derivative could be covalently attached or simply mixed to the special class of fluorescent chromophore showing aggregation-induced enhanced emission (AIEE) behavior. Perfect nonvolatile read-out of fluorescence information recorded in the photochromic fluorescent media could be achieved by employing a 4-level fluorescent dye instead of the conventional 2-level dye. Direct photoisomerization of cyanostilbene-type fluorescent molecule leading to the fluorescence quenching by itself is another promising strategy to the photo-induced fluorescence switching. Gating of photo-induced fluorescence switching by the mechanical shear force will also be demonstrated.

Education

Ph. D. Seoul National University (1988)
M. S. Seoul National University (1982)
B. S. Seoul National University (1980)

Experiences

Professor, School of Materials Sci. and Eng., Seoul National University (2004-)
Associate Prof/Assistant Prof, School of Mat. Sci. and Eng., Seoul National University (1995-2004)
Director, Organic Nano-Photonics Lab (National Research Laboratory (2004-2009)
Senior Researcher, Korea Institute of Science and Technology (1985-1995)
Editor, 'Macromolecular Research' (2009-2010)
Visiting Professor, ENS-Cachan, France (2010. 2)
Visiting Professor, Tohoku University, Japan (2009. 7-8.)
Research Scientist, RIKEN Institute, Japan (1992. 3-1993. 2)

Research Interests

Fluorescent/Phosphorescent Organic Molecules
Organic Nano-materials for Electronics and Photonics
Nonlinear Optic Material, Photorefractive Organic Material
Multifunctional Liquid Crystal, Supramolecules, and Macromolecules
ESIPT (Excited State Intramolecular Pronton Transfer), Photochromism,
AIEE (Aggregated Induced Enhanced Emission)
Transition Metal Complexes for Phosphorescence Emission and Photocatalytic Reaction
Materials for OLED, OTFT (Organic Thin Film Transistor), and Organic Solar Cells

Awards

2009. 11 Academic Research Award- Seoul National University
2007. 4 Samsung Polymer Award
2005. 12 Shinyang Engineering Award
2000. 10 Best Teacher Award – College of Engineering, Seoul National University
2002. 4 Academic Progress Award – Macromolecular Chemistry Div., Korean Chemical Society.

Nanoparticles and Nanoink for Fine Pattern Formation: Evolution of Nanoink from Silver to Copper

Dr. Masami Nakamoto

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"Controlled thermolysis" developed by our hands is a useful preparative method of various nanoparticles such as metal nanoparticles, alloy nanoparticles, and oxide nanoparticles, and so on. Particle size and combination of some capping ligands are easily controlled by this method.

Various Ag nanoinks can form conductive fine pitch pattern on a flexible polymer substrate by the low temperature firing process less than 300 ℃. The fired film shows the resistivity comparable to that of bulk Ag (1.6μΩ·cm). The 10μm fine line can be prepared on a polyimide film by screen printing, using Ag nanoink. In the case of Ag fine pitch, ionic migration may be induced. In order to avoid Ag ionic migration, we have developed Ag-Cu alloy nanoink and oxidation resistant Cu nanoink effective for the ionic migration resistant pattern formation. The conductive Ag-Cu alloy pattern and Cu pattern prepared by those nanoinks show good performance toward ionic migration, respectively.

Career

2014-2012 President, Osaka Municipal Technical Research Institute (OMTRI)
2012-2010 Executive Director, OMTRI
2010-2006 Director, Organic Materials Department, OMTRI
2006-1993 Senior Research Fellow, Electronic Materials & Inorganic Materials Departments, OMTRI
1993-1992 Invited Research Scientist, Technical University of Munich, Germany
1992-1978 Researcher, Inorganic Chemistry Department, OMTRI

Educational background

1978-1976 Division of Applied Chemistry, Graduate School of Engineering, Osaka University
1976-1972 Division of Applied Chemistry, Department of Engineering, Osaka University

Major

Nanoparticle chemistry, Nanomaterial Engineering and Their Application in the field of Printed Electronics

Activities

・Research and development of Metal, Alloy, and Oxide Nanoparticles and their application for Printed Electronics
・Project Manager, Research & Development of Nanomaterials for Next Generation Sheet Devices, Ministry of Education, Culture, Sports, Science & Technology, Japan (2010-2007)
・Project Manager, Research & Development of ITO Nanoparticle Paste, Japan Science and Technology Agency (JST) (2010-2009)
・Project Manager, Research & Development of Ag and ITO Nanoink for Electrode Formation, JST (2014-2012)
・Group Leader, Cu Fine Line Formation by Super Inkjet Process using Cu Nanoink, New Energy and Industrial Technology Development Organization (NEDO) (2013-2010)

Thermally Stable Polymers for Flexible Substrates

Prof. Chang Sik Ha

Department of Polymer Science and Engineering,
Pusan National University, Busan 609-735, Korea

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Recently much attention has been paid to a flexible substrate for electronic devices including organic light emitting device (OLED). Polymers are among such good candidates for flexible substrates owing to their light-weight, cost-effectiveness, and good processability, etc. However, low thermal stability of polymers limit their practical applications. In this sense, thermally stable polymers such as polyimides and polynorbornenes have gained much interest for the application as flexible substrates. In this presentation, I will briefly introduce recent research trends on the use of thermally stable polymers for flexible substrates based on mainly our own works. Here is one saxmple; We synthesized new polynorbornene dicarboximide (PCaNI) functionalized with hole-transporting carbazole moieties and its copolymer (PCaNA) by ring-opening metathesis polymerization (ROMP), where the PCaNA was further reacted with 3-amino-triethoxysilane to prepare PCaNI/silica hybrid. We also investigated the feasibility of PCaNI and PCaNI/silica hybrid (PCaSi) as a hole transporting material for hybrid organic light emitting devices (HOLEDs). To improve the performance of the PCaNI-based HOLEDs, N,N'-diphenyl-N,N'-(3-methylphenyl)-[1,1'-biphenyl]-4-4'–diamine (TPD) was also introduced into the PCaNI matrix. Results showed that PCaNI exhibited high glass transition temperature (~260 ^{o}C) and high optical transparency in the visible region. The HOLEDs with PCaNI/TPD or PCaSi/TPD hybrid nanolayers exhibited relatively higher luminance (~10,000 cd/m^2), lower operating voltage (~6.5 V at 300 cd/m^2), and higher current efficiency (~2.7 cd/A).

Education

1978 B.S. (Chemical Engineering), PNU
1980 M.S., Korea Advanced Institute of Science and Technology [KAIST]
1987 Ph.D., KAIST (in Polymer Physics and Engineering)

Selective Professional Appointments

1982-present Professor, PNU
2003-2008 Director, National Research Lab. of Nano-Information Materials
2010-present Director, Pioneer Research Center for Nanogrid Materials
2012 Vice President, Pusan National University

Selected Honors and Awards

Member, National Academy of Engineering of Korea (2004-)
Fellow, Korean Academy of Science and Technology (2004-)
Scientists of Month Award from Ministry of Science and Technology, Korea (11, 2006)
Best Researcher Award, Pusan National University, Korea (2007, 2009)
Samsung Polymer Science Award (2011), The Polymer Society of Korea

Research Interests

Mesoporous Materials and Nanostructured Materials; Functional Polymers; Organic/Inorganic Nanohybrid Materials; flexible substrate and organic light-emitting devices

Novel spirocyclization-based “activatable” fluorescence probes: From in vivo imaging of tiny tumors to super-resolution imaging

Prof. Yasuteru Urano

Graduate School of Medicineand Pharmaceutical Sciences, The University of Tokyo
Basic Research Program, Japan Science and Technology

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Fluorescence imaging is one of the most powerful techniques currently available for continuous observation of dynamic intracellular processes in living cells. Suitable fluorescence probes are naturally of critical importance for fluorescence imaging. Recently, we found that hydroxymethylrhodamine green (HMRG) was strongly fluorescent in aqueous solution at pH 7.4, while mono-amidated HMRG derivatives were colorless and non-fluorescent due to the preferred spirocyclized structure.

Based on above findings, we have developed various novel aminopeptidase-sensitive probes which were applicable for living cell system, including gGlu-HMRG, a novel HMRG-based “activatable” fluorescence probe for γ-glutamyltranspeptidase (GGT). We could establish a novel and highly activatable strategy for sensitive and fast-responding fluorescence imaging of tiny tumors in vivo by spraying gGlu-HMRG onto tissue surfaces that are suspected of harboring tumors, creating high signal contrast between the tumor and the background within 1 min.

We have also developed a novel class of fluorophores which spontaneously and repeatedly blink with proper average lifetime of fluorescent state without any additives and special conditions, by optimizing the equilibrium constants of intramolecular spirocyclization and the rate constants of ring-closure reaction. These are quite suitable for STORM super-resolution imaging technique, and indeed, super-resolution images of microtubules and RecA filaments on plasmid DNA could be obtained under normal oxygen conditions without any additives of thiols.

Education

1986 Faculty of Pharmaceutical Sciences, The University of Tokyo, B.S. in 1990

1990 Graduate School of Pharmaceutical Sciences, The University of Tokyo, Ph.D. in 1995

Career

1995 Post-doc fellow, the University of Tokyo funded by JSPS

1997 Assistant Professor, Graduate School of Pharmaceutical Sciences, The University of Tokyo

2004 PRESTO, Japan Science and Technology Agency (additional post)

2005 Associate Professor, Graduate School of Pharmaceutical Sciences, The University of Tokyo

2010-Present Professor, Graduate School of Medicine, The University of Tokyo

2013-Present Professor, Graduate School of Pharmaceutical Sciences, The University of Tokyo

Award

2002 Young Investigator Award of Japanese Society of Free Radical Research

2004 Young Investigator Award of Pharmaceutical Society of Japan

2006 Young Investigator Award Selected by the Ministry of Education, Culture, Sports, Science and Technology of Japanese Government

2006 Invitrogen-Nature Biotechnology Award 2006

2012 Eighth JSPS Prize (FY2011)

2012 18th Yomiuri Techno Forum Gold Medal Award

Stimuli-Sensitive Polymeric Nanoparticles for Cancer Therapy and Imaging

Prof. Jae Hyung Park

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Self-assembled polymeric micelles, composed of amphiphilic block copolymers, have received attention as anticancer drug carriers because they can circulate in blood for long periods of time, followed by selective accumulation into tumor tissue via the enhanced permeation and retention (EPR) effect. However, delivery of the drug into the intracellular compartments of the cancer cell is often insufficient due to the slow release of the drug from nanoparticles. For example, aliphatic polyester-based micelles, extensively studied as drug carriers, have shown sustained drug release over a period of days to weeks6-8, although dumping the drug to the intracellular compartments of the cell in tumor tissue can enhance therapeutic efficacy. In this regard, it is necessary to develop polymeric micelles that exhibit the rapid release of the drug, triggered by intracellular stimuli such as mildly acidic pH, reductive agents, and enzymes. After reaching the tumor sites via the EPR effect, such micelles can be internalized into tumor cells by endocytosis, followed by exposure to intracellular stimuli causing burst release of the drug.

In our group, various polysaccharide-based nanoparticles, responsive to cancer-specific stimuli, have been investigated as the drug carrier for cancer therapy, including hyaluronic acid, glycol chitosan, and carboxymethyl dextran. When such nanoparticles are administered into tumor-bearing mice, they selectively accumulated into the tumor site. Their in vivo tumor targetability were achieved via passive or active targeting mechanism. Once they reach the tumor site, the drug was rapidly released, primarily owing to the characteristic stimuli of tumor such as the low pH, reductive envionmnent, and hypoxic condition. Overall, the stimuli-sensitive polysaccharide nanoparticles might have promising potential as the carrier of the anticancer drugs.

Education

1998. 3-2002. 2	Gwangju Institute of Science and Technology, GIST (Ph.D.) Department of Materials Science and Engineering
1996. 3-1998. 2	Gwangju Institute of Science and Technology, GIST (M.S.) Department of Materials Science and Engineering
1992. 3-1996. 2	Sungkyunkwan University (B.S.) Department of Polymer Science and Engineering

Experiences

2012. 3-Present	Adjunct Professor, Samsung Advanced Institute of Health Sciences and Technology, Sungkyunkwan University
2011. 9-Present	Associate Professor, Departments of Polymer Science and Chemical Engineering, Sungkyunkwan University
2007. 3-2011. 8	Adjunct Professor, Department of Life and Nanopharmaceutical Sciences, Kyung Hee University
2005. 4-2011. 8	Assistant Professor/Associate Professor, Department of Chemical Engineering, College of Engineering, Kyung Hee University

Research Interests

Hybrid materials for molecular imaging
Polymeric micelles for tumor targeting
Injectable hydrogels for tissue engineering
Cationic polymers for gene(siRNA) delivery
Biocompatible polymers for biomedical applications