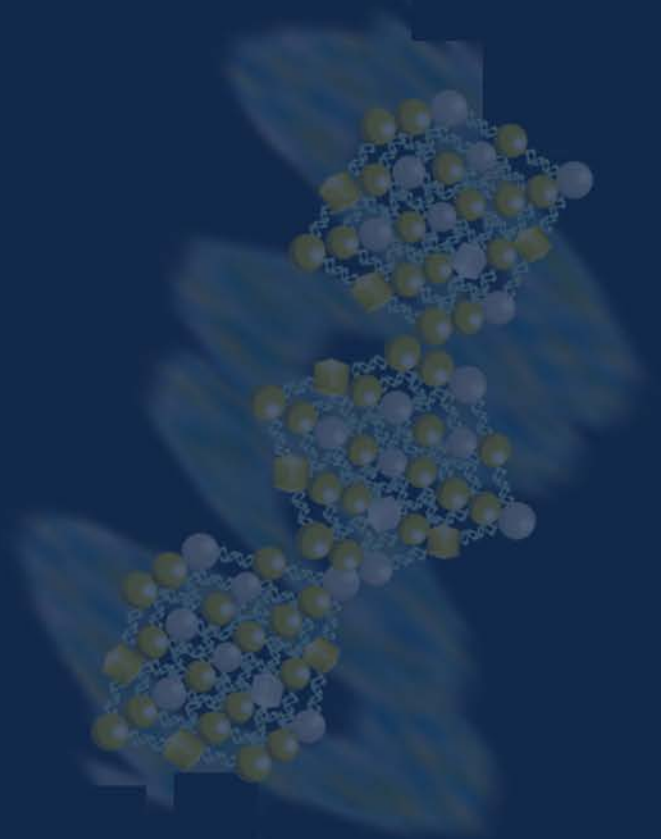
The 13th IEEE International Conference on Nano/Molecular Medicine and Engineering

IEEE-NANOMED

2019

TECHNICAL PROGRAM



IEEE

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November 21-24, 2019 | Gwangju, Korea

IEEE-NANOMED 2019 TECHNICAL PROGRAM

NOVEMBER 2019

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IEEE-NANOMED 2019

NOVEMBER 2019

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IEEE-NANOMED 2019

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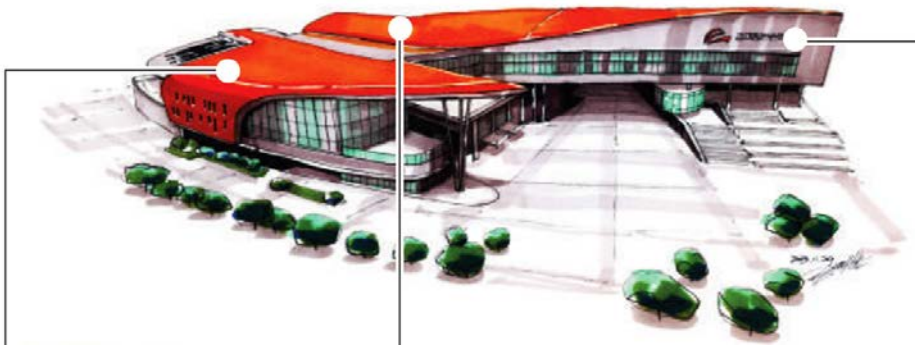
Kimdaejung Convention Center

KIMDAEJUNG CONVENTION CENTER



IEEE-NANOMED 2019
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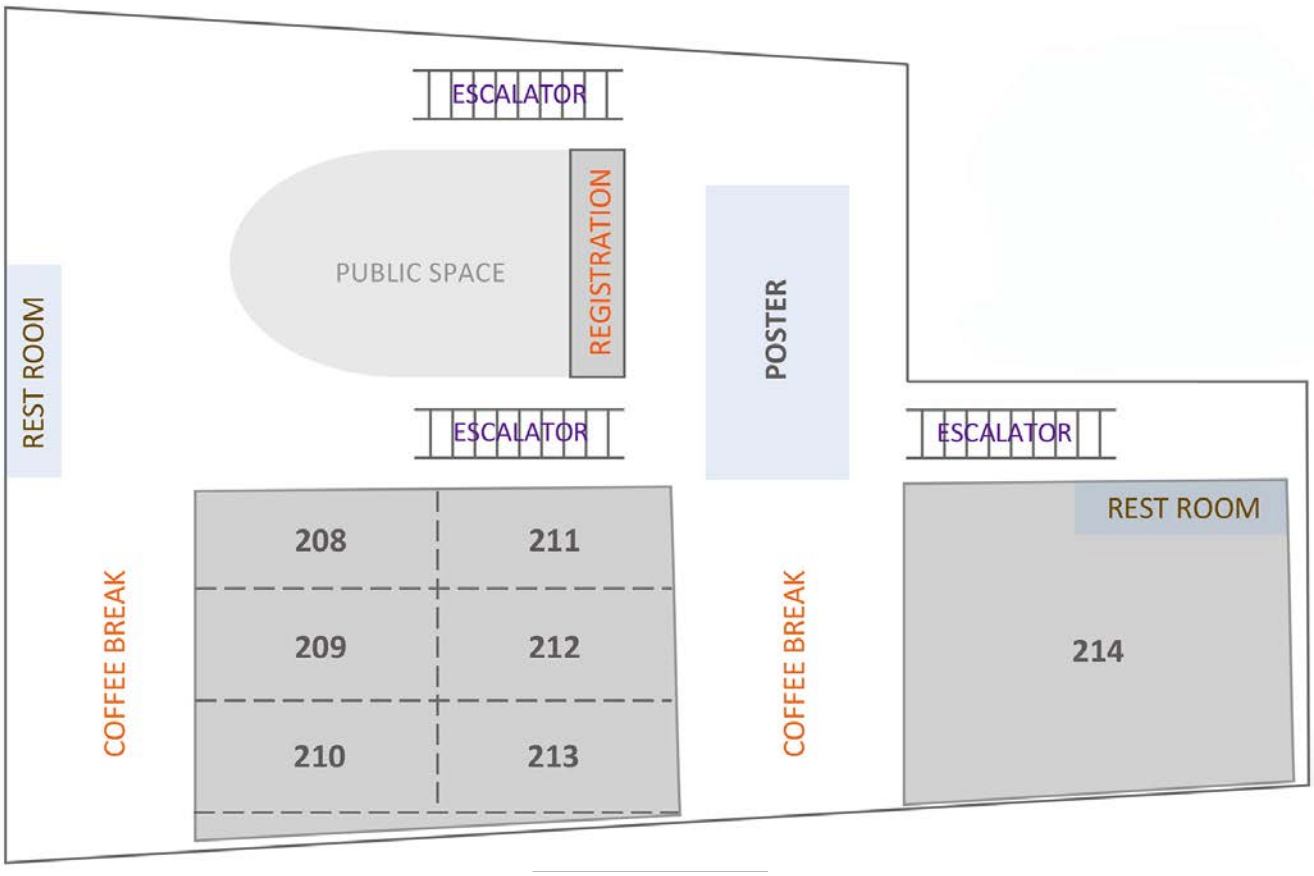
Exibition Halls

Convention Halls/
Convenient Facilities

CONFERENCE ROOMS

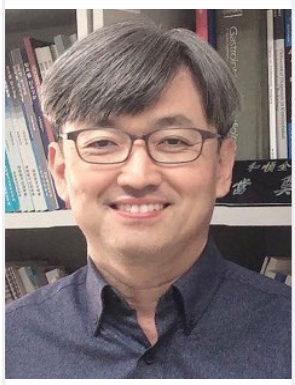
Second Floor

RM 208 - 214



On behalf of
the IEEE Nanotechnology Council
& the conference organizing
committee

WELCOME



we are delighted to welcome you to the 13th International Conference on Nano/Molecular Medicine & Engineering (IEEE-NANOMED 2019) in November 21 – 24, 2019. Originally launched in 2007, IEEE-NANOMED has grown to be one of the major international conferences in nanomedicine and nano/molecular engineering and has brought together world-class engineers, physicians and scientists from all over the world and every sector of academy and industry, enabling the exchange of the latest advances in basic and clinical research in the field of nano/molecular medicine and engineering. Prior IEEE-NANOMED conferences were held in Macau (2007), China (Suzhou, 2008), Taiwan (Tainan, 2009), Hong Kong (2010), Korea (Jeju, 2011), Thailand (Bangkok, 2011 and Phuket, 2012), Taiwan (Kaohsiung, 2013), USA (Hawaii, 2015), Macau (2016), China (Shenzen, 2017) and USA (Hawaii, 2018).

IEEE-NANOMED 2019 is destined to be one of the best yet, thanks to the talents and dedication of many volunteers, the invaluable assistance from our stellar professional staffs, and strong support from sponsors. IEEE-NANOMED 2019 is sponsored by the IEEE Nanotechnology Council, the University of Arkansas, the City University of Hong Kong, the University of Waterloo, Chonnam National University, Chonnam National University Hospital, Dovepress and MDPI, as well as Gwangju City, Gwangju Medical & Healthcare Fair and Gwangju Convention & Visitors Bureau. Special gratitude and appreciation is extended to Program Chairs and Technical Program Committee. Without their outstanding work, we would not have such an excellent and challenging technical program, which broadly reaches the field of nano/molecular medicine and engineering and provides a highly innovative and informative venue for essential and advanced scientific and engineering research as well as translational and clinical research. Fourteen state-of-the-art plenary and keynote presentations by leading experts, 38 technical sessions with over +180 invited presentations, and a poster session during our 4-day event ensure an interactive and inspiring exchange between participants, making IEEE-NANOMED 2019 the right place for new bridges in science and knowledge.

We are happy to host IEEE-NANOMED 2019 at the Kimdaejung Convention Center, Gwangju, Korea. Known as the “Hub City of Asia Culture” and famous for the “Rich & Diverse Culture and Cuisine,” Gwanju offers a near endless supply of scenic beauty and exciting activities to explore, the better to extend thought provoking and profitable discussions from the formal conference. We wish you a superb conference experience and a memorable stay in Gwangju!

Welcome to IEEE-NANOMED 2019!

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Chonnam Nat’l Univ. Medical School, Gwangju, Korea

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PLENARY & KEYNOTE HIGHLIGHTS

PLENARY

Chiming HO

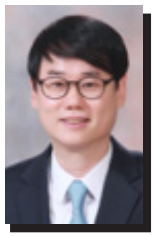
Univ. of California, Los Angeles, USA

"AI-Personalized Therapy"

Jinwoo CHEON

Yonsei Univ., Korea

"Design of Nanomaterials for Next Generation Imaging & Manipulations"



Byung Soo KIM

Seoul National Univ., Korea

"Exsome-Mimetic Extracellular Nanovesicle-Based Therapeutics"

Jung-Joon MIN

Chonnam Nat'l Univ. Medical School, Korea

"Programmable & Imageable Anti-Cancer Bacteria"

Frederico ROSEI

Institut National de la Recherche Scientifique, Canada

"Structure/Property Relationships in Biomaterials at the Nanoscale"

Osamu TABATA

Kyoto Univ. of Advanced Science, Japan

"DNA Nanotechnology to Bridge between MEMS/NEMS & Nanotechnology"

Thomas WEBSTER

Northeastern Univ., USA

"Goodby Hospitals & Hello Implantable Nano Senors"

KEYNOTE

Sangyong JON

Korea Advanced Inst. of Science & Technology, Korea

"Bioactive Compounds-Derived Nanomedicine for Anticancer & Anti-Inflammation Therapy"

Gyoo Yeol JUNG

Pohang Univ. of Science & Technology, Korea

"Sensor-Guided Evolutionary Engineering for Industrial Microorganisms"

Won Jong KIM

Pohang Univ. of Science & Technology, Korea

"Polymeric Nanomaterials for Drug & Nitric Oxide Delivery"

Hyunjoon KONG

Univ. of Illinois, Urbana-Chapaign, USA

"Biological Applications of Engineered Active Matters"

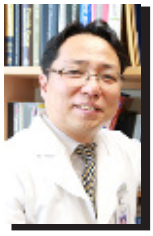
KEYNOTE & NEW INNOVATORS HIGHLIGHTS

KEYNOTE

Haeshin LEE

Korea Advanced Inst. of Science & Technology, Korea

"Polydopamine Coating & TANNylation: Mussel- & Plant-Inspired Biomaterials"



Hak Jong LEE

Seoul Nat'l Univ. College of Medicine, Korea

"Ultrasound & Drug Delivery"

Pak Kin WONG

Pennsylvania State Univ., USA

"Single Cell Biosensors for Dynamic Multigene Analysis in Complex Tissue Environments"

NEW INNOVATORS

Liming BIAN

Chinese Univ. of Hong Kong, China

"Biomaterial-Medicated Dynamic Nanoscale Presentation of Ligands for Regulating Cellular Behaviors"

Eun Ji CHUNG

Univ. of Southern California, USA

"Peptide-Based Micelles for Nanomedicine"

Peter B. LILLEHOJ

Michigan State Univ., USA

"Point-of-Care Diagnostics for Rapid Malaria Infection Detection and Monitoring"

Zong-Hong LIN

Nat'l Tsing Hua Univ., Taiwan

"Wearable Systems for Self-Powered Healthcare Applications"

Xinge YU

City Univ. of Hong Kong, China

"Piezoelectric Nano-Membranes Based Flexible Bio-integrated Electronics for Biomedical Applications"

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SS1 Smart Sensors for Healthcare Application
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SS2 Micro- and Nanoplatforms for Biomedical Applications
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Session Chair: Soo-Hong LEE, Dongguk Univ., Korea

SS4 Field Effect Based Sensor and Its Bio-Applications
Session Chair: Chao-Sung LAI, Chang Sung Univ., Taiwan

SS5 NANOMED/GROM Joint Session: Functional Organ Mimetics for Drug Discovery
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SS6 Biofabrication and 3D Tissue Modeling
Session Chair: Jinah JANG; Sungjune JUNG, Pohang Univ., Korea

SS7 Smart Biomaterials for Bio/Nano-Applications
Session Chair: Jae Young LEE, Gwangju Institute of Science & Technology, Korea

SS8 Emerging Technologies for Modeling and Diagnosis of Disease States of Human Organs
Session Chair: Hong Nam KIM, Korea Institute of Science & Technology, Korea

SS9 Lab-on-a-Chip Systems for Point-of-Care Biosensing Applications
Session Chair: Hyungsoon IM, Massachusetts General Hospital, Harvard Medical School, USA

SS10 Microfluidics for Molecular and Cellular Applications
Session Chair: Mohammad A. QASAIMEH, New York Univ.-Abu Dhabi, United Arab Emirates

SS11 Regenerative Medicine Using Nano-Technology
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SS13 Emerging Science adn Technology for Next Generation Medical Society
Session Chair: Chang-Soo LEE, Chungnam Nat'l Univ., Korea

SS14 Microfluidic System for Bio-Medical Applications (I & II)
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SS15 Nanomaterials for Medicine
Session Chair: Won Jong KIM, Pohang Univ., Korea

SS16 Externally Triggered or Image Guided Therapy Using Nanoparticles
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SS17 Advances in Bio/Nanomedicine: Nanoagents and Sensing Platforms
Session Chair: Haewook HAN, Pohang Univ. of Science & Technology, Korea; Jin-Woo KIM, Univ. of Arkansas, USA

SS18 Microsystems Technology
Session Chair: Siyuan HE, Ryerson Univ., Canada

SS19 Nanotechnologies for Medical Application
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SS20 Intelligent Micro/Nanomaterial for Biomedical Application
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SS22 Molecular Engineering in Medicine
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SS23 Clinical Diagnostics and Treatment
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SS26 Human-Plus Augmented Sensing and Smart Carbon and Colloidal Materials for Enhanced Property
Session Chair: Hyun Ho LEE, Myongji Univ., Korea

SS27 Electrostatic Interactions and Considerations in Drug Delivery and Biomedical Applications
Session Chair: Eun Ji CHUNG, Univ. of Southern California, USA

SS28 Biomaterials and Biosensors in Biomedical Applications
Session Chair: Yu-Jui FAN, Taipei Medical Univ., Taiwan

SS29 Nanomedicine and Nanoscale Drug Delivery (NND)
Session Chair: Yong-Kyu LEE, Korea Univ., Korea; Dong-Wook HAN, Pusan Nat'l Univ., Korea

SS30 Micro/Nanofluidic Bioanalysis/Synthesis with New Technology
Session Chair: Liang ZHAO, Univ. of Science & Technology, China

SS31 From DNA to Smart Materials for Biosensing Applications
Session Chair: Jung Heon LEE, Sungkyunkwan Univ., Korea

SS32 Extracellular Vesicles for Nanomedicine
Session Chair: T.N. Minh LE, Nat'l Univ. of Singapore, Singapore

SS33 Devices and Systems for Medical Applications
Session Chair: Chinese Univ. of Hong Kong, China

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Session Chair: Jungho AHN, Seoul Nat'l Univ., Korea

YR2 Young Researcher Session II: Two- and Three-Dimensional Multifunctional Biomaterials for Micro- and Nanosystems
Session Chair: Jungho AHN, Seoul Nat'l Univ., Korea

IEEE-NANOMED 2019

The 13th IEEE International Conference on
Nano/Molecular Medicine and Engineering

November 21, 2019 (Thursday)		
14:00-18:00	**Registration** (Foyer, 2/F)	
18:00-18:30		**Welcome Reception** *for all registered participants* (RM 214)
18:00-19:30		

November 22, 2019 (Friday)						
08:30-08:50	**Opening Ceremony** (RM 208-210)					
08:50-09:25	**Plenary Lecture 1**: Chi-Ming HO, Univ. of California at Los Angeles, USA (RM 208-210) ***"AI-Personalized Therapy"***					
09:25-10:00	**Plenary Lecture 2**: Federico ROSEI, Institut National de la Recherche Scientifique, Canada (RM 208-210) ***"Structure/Property Relationships in Biomaterials at the Nanoscale"***					
10:00-10:10	**Welcome Remark** (RM 208-210)					
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11:05-11:30	**Kenote Lecture 2**: Gyoo Yeol JUNG, Pohang Univ. of Science & Technology, Korea (RM 214) ***"Sensor-Guided Evolutionary Engineering for Industrial Microorganisms"***					
11:30-12:30	**Lunch** *for all registered participants*					
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12:30-13:45	**SS1** Smart Sensors for Healthcare Applications	**SS2** Micro- & Nanoplatform for Biomedical Applications	**SS3** Stem Cell Stimulating Biomaterials for Regeneratuve Medicine	**Best Paper Competition** Paper ID: 2*, 11, 14*, 20*, 23*, 29, 31 **Student Papers*	**SS4** Field Effect Based Sensor & Its Bio-Applications + Paper ID: 33	**SS5: NANOMED/GROM Joint Session** Functional Organ Mimetics for Drug Discovery
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November 23, 2019 (Saturday)

08:30-09:05	**Plenary Lecture 3**: Byung Soo KIM, Seoul Nat'l Univ., Korea (RM 208-210) ***"Exsome-Mimetic Extracellular Nanovesicle-Based Therapeutics"***					
09:05-09:40	**Plenary Lecture 4**: Jung-Joon MIN, Chonnam Nat'l Univ., Korea (RM 208-210) ***"Programmable & Imageable Anti-Cancer Bacteria"***					
09:40-10:05	**Keynote Lecture 3**: Won Jong KIM, Pohang Univ. of Science & Technology, Korea (RM 208-210) ***"Polymeric Nanomaterials for Drug & Nitric Oxide Delivery"***					
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12:40-13:15	**Plenary Lecture 5**: Osamu TABATA, Kyoto Univ. of Advanced Science, Japan (RM 208-210) ***"DNA Nanotechnology to Bridge between MEMS/NEMS & Nanomedicine"***					**Poster Session** (Foyer, 2/F) Paper ID: 9, 13, 19, 24, 25, 27, 39, 40, 41, 42, 43, 44, 45, 46, 47, 38, 49, 50, 51, 52, 53, 54, 57
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14:55-15:20	**Keynote Lecture 7**: Hyunjoon KONG, Univ. of Illinois at Urbana-Champaign, USA (RM 208-210) ***"Biological Applications of Engineered Active Matters"***					
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18:30-21:00	**Conference Banquet** *for all registered participants*					

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10:15-10:35	**Coffee Break** (Foyer, 2/F)				
10:35-11:10	**Plenary Lecture 6**: Thomas WEBSTER, Northeastern Univ., USA (RM 214) ***"Goodbye Hospitals & Hello Implantable Nano Sensors"***				
11:10-11:45	**Plenary Lecture 7**: Jinwoo CHEON, Yonsei Univ., Korea (RM 214) ***"Design of Nanomaterials for Next Generation Imaging & Cell Manipulations"***				
12:00-13:00	**Farewell Reception** *for all registered participants*				

AI-Personalized Therapy

PL1: 08:50 – 09:25
Friday, November 22, 2019
Location: RM 208-210

CHI-MING HO

University of California, Los Angeles, USA
chihming@g.ucla.edu

ABSTRACT

In clinical setting, a doctor still cannot quantitatively determine the efficacy/toxicity after treating a specific patient with either monotherapy or combinatorial therapy.

Neural networks can relate drug-dose inputs to the patient's body response through a set of training data. Training neural networks with several hundred tests of cancer cells treated by combinatorial drugs. We discovered that the number of killed cancer cells is related to the doses through a parabolic response surface (PRS), which is governed by a quadratic algebraic equation. Note that the coefficients of the PRS equation are not constants and are function of time and many other parameters. This PRS relation also holds true for tests in animal and human bodies. Hence, the AI-PRS platform can quantitatively determine the optimal drug-dose combination for treating a specific patient or a population of patients.

We have demonstrated how this PRS platform can determine the optimal drug-dose combination and dynamically adjust the doses for about 30 different disease models. The question is why this PRS platform works. Human body is a complex system, which composes of a cascade of low level complex systems – cell, tissue and organ. Unique characteristics of a complex system is that a large number of interacting elements will result in emerging system properties, which cannot be directly related to the interactions among the interacting elements. In the case of therapy, the interacting components are drug molecules and disease causing elements, e.g. cancer cells or bacteria. The emerging properties are efficacy and/or toxicity. The AI analysis enables us to discover that the emerging property is related to the interacting components through a well-defined non-linear algebraic equation, which removes the key roadblock in quantitative therapeutic applications.

SHORT BIO

Prof. Chih-Ming Ho received Ph.D. from The Johns Hopkins University. He held the Ben Rich-Lockheed Martin Chair Professor until retired in 2016 and currently is a UCLA Distinguished Research Professor. He served as UCLA Associate Vice Chancellor for Research from 2001 to 2005.

His research interests include AI-medicine, microfluidics and control of turbulence. He is ranked by ISI as one of the top 250 most cited researchers worldwide in the entire engineering category (2000-2014). Dr. Ho was inducted as a member of the US National Academy of Engineering and an Academician of Academia Sinica. Dr. Ho received Doctor of Engineering Honoris Causa from Hong Kong University of Science and Technology. He holds ten honorary chair professorships including the Einstein Professorship from Chinese Academy of Science. Dr. Ho was elected Fellow of AAAS, APS, AIMBE, AIAA and 3M-Nano Society.

Structure/Property Relationships in Biomaterials at the Nanoscale

PL2: 09:25 – 10:00
Friday November 22, 2019
Location: RM 208-210

Frederico Rosei

Institut National de la Recherche Scientifique
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Abstract

Nanostructuring materials allows to optimize their properties, by exploiting size effects. We created nanopatterns that act as surface cues, affecting cell behavior. Chemical oxidation creates nanoscale topographies, that improve biocompatibility. Our treatment provides a differential signal, selectively inhibiting fibroblast proliferation while promoting osteoblast growth in vitro. Related strategies for tissue regeneration and repair are also discussed. Further, we discuss the structure of silk and its remarkable properties. Improving antibacterial properties using laser/plasma strategies and growing graphene oxide coatings will be discussed. Finally, sensing and therapeutic approaches can be harnessed by exploiting the optical properties of nanocrystals, including Quantum Dots and upconverting nanoparticles.

Short Bio

Federico Rosei received MSc (1996) and PhD (2001) degrees from the University of Rome "La Sapienza". He held the Canada Research Chair (Junior) in Nanostructured Organic and Inorganic Materials (2003–2013) and since May 2016 he holds the Canada Research Chair (Senior) in Nanostructured Materials. He is Professor at the Centre Énergie, Matériaux et Télécommunications, Institut National de la Recherche Scientifique, Varennes (QC) Canada, where he served as Director from July 2011 to March 2019. Since January 2014 he holds the UNESCO Chair in Materials and Technologies for Energy Conversion, Saving and Storage.

Dr. Rosei's research interests focus on the properties of nanostructured materials, and on how to control their size, shape, composition, stability and positioning when grown on suitable substrates. He has extensive experience in fabricating, processing and characterizing inorganic, organic and biocompatible nanomaterials. His research has been supported by multiple funding sources from the Province of Quebec, the Federal Government of Canada as well as international agencies, for a total in excess of M$ 16. He has worked in partnership with over twenty Canadian R&D companies. He is co-inventor of three patents and has published over 315 articles in prestigious international journals (including Science, Nature Photonics, Proc. Nat. Acad. Sci., Adv. Mater., Angew. Chem., J. Am. Chem. Soc., Adv. Func. Mater., Adv. En. Mat., Nanolett., ACS Nano, Biomaterials, Small, Phys. Rev. Lett., Nanoscale, Chem. Comm., Appl. Phys. Lett., Phys. Rev. B, etc.), has been invited to speak at over 310 international conferences and has given over 240 seminars and colloquia, over 55 professional development lectures and 40 public lectures in 46 countries on all inhabited continents. His publications have been cited over 12,400 times and his H index is 56.

He is Fellow of numerous prestigious national and international societies and academies, including: the Royal Society of Canada, the European Academy of Science, the African Academy of Sciences, the World Academy of Art and Science, the World Academy of Ceramics, the Academia Europaea, the American Physical Society, AAAS, the Optical Society of America, SPIE, the Canadian Academy of Engineering, ASM International, the Royal Society of Chemistry (UK), the Institute of Physics, etc.

He has received numerous awards and honours, including the FQRNT Strategic Professorship (2002–2007), the Tan Chin Tuan visiting Fellowship (NTU 2008), the Senior Gledden Visiting Fellowship (UWA 2009), Professor at Large at UWA (2010–2012), a Marie Curie Post-Doctoral Fellowship from the European Union (2001), a junior Canada Research Chair (2003–2013), a senior Canada Research Chair (2016–2023) a Friedrich Wilhelm Bessel Award from the Alexander von Humboldt foundation (2011), the Rutherford Memorial Medal in Chemistry (Royal Society of Canada 2011), the Herzberg Medal (Canadian Association of Physics 2013), the Brian Ives lectureship award (ASM international / Canada Council 2013), the Award for Excellence in Materials Chemistry (Canadian Society for Chemistry 2014), the NSERC EWR Steacie Memorial Fellowship (2014), the José Vasconcelos Award for Education (World Cultural Council 2014), the IEEE NTC Distinguished Lectureship 2015–2016, the Lash Miller Award (Electrochemical Society 2015), the Recognition for Excellence in Leadership from the American Vacuum Society (2015), the Selby Fellowship from the Australian Academy of Sciences (2016), the John C. Polanyi Award (Canadian Society for Chemistry 2016), the Outstanding Engineer Award (IEEE Canada 2017), the President's Visiting Fellowship for Distinguished Scientists (Chinese Academy of Sciences 2017), the Sigma Xi Distinguished Lectureship (2018–2020), the Sichuan 1000 talent (short term) award, the Lee Hsun Lecture Award (2018), the IEEE Montreal Gold Medal (2018), the APS John Wheatley Award (2019) and the Blaise Pascal Medal (European Academy of Science 2019), etc.

Exosome-Mimetic Extracellular Nanovesicle-based Therapeutics

PL3: 08:30 – 09:05
Saturday, November 23, 2019
Location: RM 208-210

Byung Soo Kim

School of Chemical & Biological Engineering
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Abstract

Mesenchymal stem cell (MSC)-derived exosomes have been spotlighted as a promising therapeutic agent for cell-free regenerative medicine. However, poor organ-targeting ability and insufficient therapeutic efficacy of systemically injected MSC-exosomes are identified as critical limitations for their further applications. We fabricated MSC-derived, exosome-mimetic nanovesicles (NV) that contained larger amounts of therapeutic molecules and exhibited diseased organ-targeting ability. We evaluated the therapeutic efficacy of the NV in animal models of various diseases including spinal cord injury, myocardial infarction, and ischemic stroke. We also utilized exosome-mimetic NV to potentiate anticancer efficacy of immune checkpoint Inhibitors. On the other hand, the limitations of the drug carriers for current chemotherapy were improved. Liposomes are clinically used as drug carriers for cancer therapy, however, unwanted leakage of the encapsulated anti-cancer drug and poor tumor-targeting efficiency of liposomes may generate toxic side effects on healthy cells and lead to failure of tumor eradication. To overcome these limitations, we functionalized liposomes with a photosensitizer-embedded cancer cell membrane. A lipid adjuvants was also embedded in the lipocomplex to promote the anti-cancer immune response. The lipocomplex effectively inhibited tumor growth and metastasis.

Short Bio

Prof. Byung-Soo Kim received his B.S. and M.S. degrees in Chemical Technology from Seoul National University in 1990 and 1992, respectively, and Ph.D. degree in Chemical Engineering from University of Michigan in 1999. After a postdoctoral fellowship at Harvard Medical School, he had been Assistant and Associate Professor in Hanyang University, Seoul between 2001 and 2009, and currently serve as a Professor in Seoul National University since 2009. His major research interests are tissue engineering, stem cells, and biomaterials. He has been an active researcher with 350 publications in peer-reviewed journals (H-index 77), 16 book chapters, and 27 patents. He has received William B. Walsh Award and Shinyang Award. He had served or now serves as an Associate Editor or an editorial board member of more than 10 journals. He has served as the Chair of Scientific Committee of Korean Tissue Engineering and Regenerative Medicine Society, an organizer of 15th International Biotechnology Symposium, and an associate member of The Korean Academy of Science and Technology.

Programmable & Imageable Anti-Cancer Bacteria

PL4: 09:05 – 09:40
Saturday, November 23, 2019
Location: RM 208-210

JUNG-JOON MIN

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ABSTRACT

Recent advances in cancer therapeutics, such as targeted therapy and immunotherapy, have raised the hope for cures for many cancer types. However, there are still ongoing challenges to the pursuit of novel therapeutic approaches, including high toxicity to normal tissue and cells, difficulties in treating deep tumor tissue, and the possibility of drug resistance in tumor cells. The use of live tumor-targeting bacteria provides a unique therapeutic option that meets these challenges. Compared with most other therapeutics, tumor-targeting bacteria have versatile capabilities for suppressing cancer. Bacteria preferentially accumulate and proliferate within tumors, where they can initiate antitumor immune responses. Bacteria can be further programmed via simple genetic manipulation or sophisticated synthetic bioengineering to produce and deliver anticancer agents based on clinical needs. Therapeutic approaches using live tumor-targeting bacteria can be applied either as a monotherapy or in combination with other anticancer therapies to achieve better clinical outcomes. In this presentation, I will introduce and summarize the potential benefits and challenges of this anticancer approach and further discuss how live bacteria interact with tumor microenvironments to induce tumor regression. I'll also provide examples of different methods for engineering bacteria to improve efficacy and safety. Finally, I introduce imaging technology for visualization and trafficking of therapeutic bacteria in living subjects. Imaging strategies for bacterial trafficking have been tried using diverse technologies such as optical bioluminescence, fluorescence, PET, MRI and optoacoustic strategies. Despite the merit of optical imaging, its low potential in human application limits the use in numerous types of animal models. For PET imaging, recently, bacteria-specific radiotracer, 18F-FDS (fluorodeoxy sorbitol), which accumulates in gram negative bacteria through transporter, successfully imaged bacteria by our group without transformation with reporter gene. In addition to FDS PET, I will introduce optoaccoustic strategy for imaging bacteria expressing optoacoustic reporter gene.

SHORT BIO

Dr. Jung-Joon (John) Min is a Chair of the Department of Nuclear Medicine at Chonnam National University (CNU). His work is focused on the molecular imaging and cancer theranostics of living subjects, with a particular emphasis on microbial-based cancer theranostics. His lab has developed genetically engineered oncolytic bacteria along with companion imaging assays as well as molecular imaging probes for numerous diseases. Dr. Min is also director of the Institute for Molecular Imaging & Theranostics (iMIT).

Dr. Min received his MD and PhD from CNU Medical School, Gwangju, South Korea. He completed clinical training of Nuclear Medicine at CNU Hospital and Seoul National University Hospital by 2000. In 2001, He moved to USA where he pursued postdoctoral research with Prof. Sam Gambhir at UCLA and Stanford University. He joined the CNU faculty in 2004 to direct the Laboratory of In Vivo Molecular Imaging (LOVMI) and to head the Department of Nuclear Medicine. He recently founded a biotechnology company, CNCure.

Dr. Min has authored over 200 publications in the field and has over 30 patents filed or granted. He holds numerous leadership roles including serving on the Board of Trustees for the World Molecular Imaging Society (WMIS). He has a huge amount of experience in Society leadership, including the Korean Society of Nuclear Medicine (KSNM) where he is currently the President-elect, as well as the Korean Society of Molecular Imaging (KSMI), the Federation of Asian Societies for Molecular Imaging (FASMI), and the Asian Oceanian Federation of Nuclear Medicine (AOFNMB).

DNA Nanotechnology to Bridge between MEMS/NEMS and Nanomedicine

PL5: 12:40 – 13:15
Saturday, November 23, 2019
Location: RM 208-210

Osamu Tabata

Kyoto University of Advanced Science
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Abstract

How can we improve functionality of MEMS/NEMS by incorporate nanoscale structure made of various nanomaterials such as nanoparticles, nanotubes, proteins and other molecules? One promising way is to utilize self-assembly technique of multiple functional nanocomponents as Nature does. Although a complexity of the structure is essential factor to generate functionality, so far, no engineering methodology has been established to assemble multiple functional nanocomponents to specific positions on MEMS/NEMS in a specific sequence. This is a challenging goal to be addressed, namely controlling assembly position and sequence of multiple nanoscale functional components made of a variety of nanomaterials to realize high functional Nanosystem.

To address this goal, a concept of an Oriented Self-Assembly on MEMS has been proposed. In this approach, DNA origami (DO) is self-assembled on MEMS according to a given system design. The advantages of DO as a nanocomponent can be summarized as; (1) the surface is precisely addressable with sub-nanometer resolution, (2) various nanomaterials can conjugate with DO, (3) higher order structure (multimer structure) can be formed by binding them each other, (4) various 2D or 3D shape can be constructed, (5) mechanical rigidity is controllable, (6) DNA based sensing and actuation mechanism can be incorporated. Owing to these advantages, many applications including sensors and their application to nanomedicine will be expected. In this talk, the current status of DNA nanotechnology, newly proposed DNA origami sacrificial process and its potential application will be presented.

Short Bio

Osamu Tabata received his M.S. and Ph.D. degrees from Nagoya Institute of Technology, Japan, in 1981 and 1993, respectively. In 1981, he joined the Toyota Central Research and Development Laboratories, Inc., Japan. In 1996, he joined the Department of Mechanical Engineering, Ritsumeikan University, Japan. In 2003, he moved to the Department of Mechanical Engineering, Kyoto University, Japan. Since April 2005, he has been a Professor at the Department of Micro Engineering, Kyoto University. From October 2019, he moved to Kyoto University of Advanced Science as a founding Dean of Engineering School. He is currently engaged in research on micro/nano processes, MEMS, DNA nanotechnology.

Prof. Tabata was a guest professor at the Department of Microsystem Engineering, University of Freiburg, Germany from September to December 2000, a guest Professor of ETH Zurich, Switzerland from January to March 2001, a visiting senior international scientist of the Chinese Academy of Science in 2010, a guest Professor of Huazong University of Science and Technology, China from July 2011 to July 2014, a senior research fellow at the Freiburg Institute for Advanced Studies (FRIAS) from May 2010 to September 2012, a distinguished visiting researcher of American University in Cairo in 2016 and a visiting Professor of Tsinghua University China from November 2018. He is a senior editor of the IEEE Transactions on Nanotechnology (TNANO), an associate editor of the ASME/IEEE Journal of Micro Electro Mechanical Systems (JMEMS), and an editorial board member of the Elsevier Journal Sensors and Actuators. He is also a program committee member of many important International Conferences in his area of expertise. He is a Fellow of Institute of Electrical Engineer Japan.

Goodbye Hospitals and Hello Implantable Nano Sensors

PL6: 10:35 – 11:10
Sunday, November 24, 2019
Location: RM 214

THOMAS WEBSTER

Department of Chemical Engineering
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ABSTRACT

There is an acute shortage of organs due to disease, trauma, congenital defects, and most importantly, age related maladies. While tissue engineering (and nanotechnology) has made great strides towards improving tissue growth, infection control has been largely forgotten. Critically, as a consequence, the Centers for Disease Control in the U.S. have predicted more deaths from antibiotic-resistant bacteria than all cancers combined by 2050, culminating into a prediction of 3 deaths every second. Moreover, there has been a lack of translation to real commercial products. This talk will summarize how nanotechnology with FDA approval can be used to increase tissue growth and decrease implant infection without using antibiotics. Studies will also be highlighted using nano sensors (while getting regulatory approval).

We have grown nanoparticles and induced nanoscale surface features on numerous implants inserted today. We have further grown sensors off of currently implanted biomaterials. Lastly, we have fabricated a wide range of self-assembled materials using them to both increase tissue growth and reduce infection. This talk will emphasize both in vitro and in vivo studies.

Our group has shown that nanofeatures, nano-modifications, nanoparticles, and most importantly, nanosensors can reduce bacterial growth without using antibiotics. This talk will summarize techniques and efforts to create nanosensors for a wide range of medical and tissue engineering applications, particularly those that have received FDA approval and are currently being implanted in humans. Moreover, our nanosensors can communicate to hand held devices cellular events at the surface of the implant and, in turn, such sensors can communicate back to release molecules that reduce infection, inhibit inflammation, and/or increase tissue growth.

Nanotechnology has proven to be a technology that can be approved by the FDA to improve tissue growth, limit infection, and inhibit inflammation without the use of drugs. Further nanosensors can be implanted with biomaterials to determine their fate and even control cellular events to promote success. In this manner, nanotechnology is revolutionizing healthcare.

SHORT BIO

Thomas J. Webster's (H index: 88) degrees are in chemical engineering from the University of Pittsburgh (B.S., 1995) and in biomedical engineering from Rensselaer Polytechnic Institute (M.S., 1997; Ph.D., 2000). Prof. Webster has graduated/supervised over 189 visiting faculty, clinical fellows, post-doctoral students, and thesis completing B.S., M.S., and Ph.D. students. He is the founding editor-in-chief of the International Journal of Nanomedicine (pioneering the open-access format). Prof. Webster currently directs or co-directs several centers in the area of biomaterials: The Center for Natural and Tropical Biomaterials (Medellin, Colombia), The Center for Pico and Nanomedicine (Wenzhou China), and The International Materials Research Center (Soochow, China). He regularly appears on NBC, CNN, MSNBC, ABC News, National Geographic, Discovery Channel, and BBC News talking about science and medicine. He has received numerous honors and is a current a fellow of numerous societies including: AANM, AIMBE, BMES, NAI, IJN, FSBE, and RSM.

Design of Nanomaterials for Next Generation Imaging and Cell Manipulations

PL7: 11:35 – 12:10
Sunday, November 24, 2019
Location: RM 214

JINWOO CHEON

Institute for Basic Science (IBS) Center for Nanomedicine, Daejeon, Korea
Department of Chemistry, Yonsei University, Seoul, Korea
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ABSTRACT

One of the important trends of next-generation biomedical sciences is the development of new tools that can accurately image, identify, and execute desired missions in a selectively programed manner. Nanotechnology is among one of the essential platform tools for targeted imaging, therapy, and simultaneous monitoring of therapeutic efficacy. In this talk, I will discuss magnetic nanoparticles as a core platform material and tool for a variety of functionalities such as sensing, targeting and signaling of cells in a selective and efficient way. Their unique utilizations in highly accurate dual-modal MR imaging, therapeutic hyperthermia of cancer cells, controlled drug/gene delivery, and molecular level cell signaling and cell fate control will be discussed.

SHORT BIO

Jinwoo Cheon is the Director of the Institute for Basic Science – Center for NanoMedicine (IBS CNM) and a Horace Underwood Professor of Chemistry at Yonsei University in Seoul, South Korea. He graduated from Yonsei University with his B.S. and received his Ph.D. from University of Illinois at Urbana. After his post-doctoral study at Berkeley and UCLA, he started his academic career at KAIST in 1998. Since 2002, he has been a professor at Yonsei University. He has received recognitions including Presidential Young Scientist Award, Korean Chemical Society Academic Award, Inchon Prize, Posco ChungAm Prize, Ho-Am Prize, and Illinois Sheth International Alumni Award. He is a Fellow of Royal Society of Chemistry and an American Chemical Society Fellow. Since 2009, he has been a Senior Editor of Accounts of Chemical Research (ACS). His research is focused on the
"rational design" of inorganic nanomaterials and the development of "nanoscale probes and tools" for biomedical sciences.

Bioactive Compounds-Derived Nanomedicine for Anticancer & Anti-Inflammation Therapy

KN1: 10:30 – 11:05
Friday, November 22, 2019
Location: RM 214

Sangyong Jon

KAIST Institute for the BioCentury
Center for Precision Bio-Nanomedicine
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Abstract

Despite the high potency of bilirubin (BR) as an endogenous anti-inflammatory compound, its clinical translation has been hampered because of its insolubility in water and potential toxicity on erythrocytes and immune cells. To overcome the critical issues, we attached polyethylene glycol (PEG) to BR, yielding PEGylated bilirubin (PEG-BR). The PEG-BR self-assembled into nanoscale particles with a size of approximately 110 nm, termed bilirubin nanoparticles (BRNPs). Unlike free BR, BRNPs are fairly water-dispersible and circulate much longer in blood, thus overcoming a critical issue associated with the clinical use of BR. Recently, we demonstrated that BRNPs had potent therapeutic efficacy in animal models of several inflammatory diseases, including inflammatory bowel disease, acute asthma and hepatic ischemic reperfusion injury. We also demonstrated that BRNPs can be used as a dual-stimulus (light and ROS)-responsive drug-delivery carrier, reflecting the fact that BR in NPs undergoes a switch in water solubility and degradation in response to these stimuli. Very recently, we recoginzed that BR, a bile pigment that exerts potent antioxidant and anti-inflammatory effects, is also a major constituent of black pigment gallstones found in bile ducts under certain pathological conditions. Inspired by the intrinsic metal-chelating power of BR found in gallstones, in this talk I will present various metals-chelated BR-based nanoparticle for use as a new theranostic nanomedicine for combined cancer imaging and photothermal therapy.

Short Bio

Dr. Sangyong Jon received his B.S. in 1993, M.S. in 1995, and Ph.D. in 1999 from the Department of Chemistry at KAIST, Korea. From 2002 to 2004 he had experienced his postdoc career in Langer Lab in the Department of Chemical Engineering at MIT. Then he joined GIST and promoted to a Professor in 2010. In 2012, he moved to KAIST and is currently a KAIST Chair Professor in the Department of Biological Sciences at the institute. Since 2018, he has been leading as a director 'Center for Precision Bio-Nanomedicine' funded by the National Research Foundation of Korea. His research interest lies at the interface of biomedicine, biotechnology, biomaterials, and nanomedicine. A major research focus is on biomedical applications toward disease diagnostics and therapy, which include i) a novel class of high-affinity peptide (Aptide library) platform for biomedical applications, ii) stimuli-responsive, anti-inflammatory bilirubin nanoparticle platform for biomedical applications, iii) nanoparticle vaccine and cancer immunotherapy, and iv) a platform that enables generation of 3D cancer stem cell spheroids for cancer research and drug development. Dr. Jon has published over 150 papers and 90 patents with citation of ~15,000 and h-index of 54. His proprietary technologies have been licensed to numerous companies. He also founded three startup companies, Aptide Inc (2010), Koan Biotherapeutics (2013), and BiliX Inc (2018).

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Sensor-Guided Evolutionary Engineering for Industrial Microorganisms

KN2: 11:05 – 11:30
Friday, November 22, 2019
Location: RM 214

Gyoo Yeol Jung

Department of Chemical Engineering & I-Bio Program
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Abstract

Functional modification of metabolic pathways including metabolic enzymes under various circumstances is critical for optimization of microbial metabolism for the production of value-added products. Due to the complexity of metabolism, pathway optimization is hard to be accomplished by the rational approaches. Metabolic enzymes, especially, has to be improved under intracellular circumstances and consequently, in-vivo screening is known to be best way for the metabolic enzymes. Therefore, library generation should be carefully achieved based on structure information and assistance of bioinformatics with the library size suitable for in-vivo screening of the metabolic enzymes of interest. In-vivo screening of the metabolic enzymes is, however, not easy to be high-throughput because function of metabolic enzymes should be evaluated by the production of the target metabolites which can be achieved only by the measurement of metabolite concentration during the cultivation. Recently, a number of intracellular metabolite sensors using transcription factors and riboswitches combined with the fluorescent proteins and antibiotic resistant proteins as the reporters have been developed and applied to high-throughput in-vivo screening. In this presentation, directed evolution of metabolic enzymes using intracellular metabolite sensors based on transcription factors and riboswitches will be demonstrated. Specifically, (i) basic principle of metabolic engineering, (ii) development of synthetic riboswitches for target metabolites, (iii) functional modulation of intracellular metabolite sensors by combination of genetic circuits, and (iv) application for directed evolution of cellular metabolism including metabolic enzymes will be covered.

Short Bio

Gyoo Yeol Jung is Vice President of academic affairs as well as a Professor of Department of Chemical Engineering and Interdisciplinary School of Bioscience and Bioengineering (I-Bio Program), POSTECH of Korea. He received his Ph.D. degree from Seoul National University of Korea and did his postdoc research at MIT with professor Gregory Stephanopoulos. His research is focused on Synthetic Biology and Genetic Analysis System. He published a number of papers in the

premier journals such as Science and Nature Communications. He was awarded a number of awards including Best Researcher Award by Korea Society of Biotechnology and Bioengineering. Dr. Jung is an Associate Editor of Journal of Biological Engineering and Biotechnology and Bioprocess Engineering, and editorial board member of Metabolic Engineering, Scientific Reports, and Electrophoresis.

Polymeric Nanomaterials for Drug and Nitric Oxide delivery

KN3: 09:40 – 10:05
Saturday, November 23, 2019
Location: RM 208-210

Won Jong KIM

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Abstract

As tumors are three-dimensional, systemically injected nanoparticles are mostly uptaken by the cells located on surfaces of cancer tissues, lacking deep-penetration into core cancer regions. Modulating the size and structure of the assembled structure using the sequence-specific hybridization and dehybridization of pH-sensitive functional DNA known as the i-motif is a potential strategy for deep penetrating into tumor tissue. According to pH changes, the structure of functional DNA was transformed dynamically, leading to a release of the cargo, thus achieving the specific delivery of siRNA or an anticancer drug, doxorubicin (DOX). Taking advantage of the intrinsic optical properties of Au nanoparticles, which depend on their size, a cytosine rich i-motif sequence was employed for intracellular pH-sensitive duplex dissociation and subsequent aggregation of the DNA-Au nanomachine, enabling anti-cancer drug release and photothermal ablation upon irradiation with infrared light. Moreover, another functional DNA sequence, a G-quadruplex, was exploited for the stable loading and intracellular delivery of a photosensitizer to achieve effective photodynamic therapy under red light illumination. Furthermore, the combinatorial chemo, photodynamic, and photothermal therapeutic effects of the functional DNA-decorated Au nanomachines were evaluated in vitro and in vivo using a triple negative breast cancer model.

In this study, we also developed novel nitric oxide (NO) delivery system using catecholamine and diazeniumdiolates. Simple two-step reactions comprising catecholamine and diazeniumdiolates enable virtually any material surfaces to release NO with appreciable storage. The modified surfaces showed the antibacterial activity without cytotoxicity. We also prepared NO-scavenging hydrogel for alleviating inflammatory disease such as rheumatoid arthritis (RA). We developed a NO-responsive macro-sized hydrogel by incorporating an NO-cleavable crosslinker (NOCCL); we further evaluated the effectiveness of the NO-scavenging nano-sized hydrogel for treating RA. The NO-Scv gel reduced inflammation levels by scavenging NO in vitro and significantly suppressed the onset of RA as observed in vivo in a mouse RA model.

Short Bio

Prof. Won Jong Kim received his BSc from Hanyang University in 1998, and M.S. and Ph. D. in Biomolecular Engineering in 2004 at Tokyo Institute of Technology. During his graduate studies with Profs T. Akaike and A. Maruyama, he developed a polymer-mediated DNA detection system. From 2004 to 2007, he was a postdoctoral fellow at the University of Utah under the supervision of Prof. Sung Wan Kim. Currently, he is a Mueunjae chaired professor at the Department of Chemistry, POSTECH. His contributions during the past 12 years as POSTCH faculty have been acknowledged by the publication of more than 130 peer-reviewed articles in the most important journals in his field, such as Nature Comm, Angew Chem, Adv. Mat., ACS Nano, Nano Lett, Small, and Biomaterials. Dr. Kim has also given more than 70 invited talks and lectures in national and international conferences and universities. He received KCS-Wiley Young Chemist Award (2011), Wiley-PSK Journal of Polymer Science Young Scientist Award (2012), KCS-Award for the Advancement of Science (2014), and PSK-Mid-career Researcher Academy Award (2015). He is an associate editor of newly launched journal "Nanotheranostics", and editorial member of "Materials Today Chemistry", and advisory board member of "Biomaterials Science".

Single Cell Biosensors for Dynamic Multigene Analysis in Complex Tissue Environments

KN4: 13:15 – 13:40
Saturday, November 23, 2019
Location: RM 208-210

Pak Kin WONG

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Abstract

Heterogeneity is a common feature of biological systems and plays essential roles in numerous biomedical processes, such as cancer invasion, immune responses, and microbe-host interactions. Conventional tissue culture approaches, however, often focus on the behaviors of cells at the population level, and pay little attention to the functional heterogeneity and cooperativity of cellular subpopulations. The investigation of cellular heterogeneity is further hampered by the lack of effective approaches to dynamically monitor biological processes, such as gene expression and metabolic activities, in complex tissue structures. Existing single cell analysis techniques often require physical isolation or lysis of cells to "snapshot" RNA and protein biomarkers in a small subset of cells. Features of the complex microenvironment, such as hierarchical organization and dynamic cellular processes, are inherently lost by studying cells in isolation, fixation, and lysis. To address this challenge in biomedical research, we are developing a multiplex biosensing platform to enable dynamic single cell gene expression analysis in complex tissue environments. In particular, we design nanoengineered biosensors that enable endocytic uptake for real-time, dynamic intracellular detection of mRNA/ncRNA, protein,

and small molecules in living cells and tissues. In this presentation, I will discuss the application of the biosensing platform for rapid microbiological analysis, including pathogen identification and antimicrobial susceptibility testing, and probing leader cell formation during collective invasion of bladder cancer.

Short Bio

Pak Kin Wong is a Professor of Biomedical Engineering, Mechanical Engineering, and Surgery at the Pennsylvania State University. Prior to Penn State, Dr. Wong was a faculty in the Departments of Aerospace and Mechanical Engineering and Biomedical Engineering at the University of Arizona. He received his Ph.D. from the University of California, Los Angeles in 2005. His research focuses on single cell analysis techniques for elucidating collective cell migration in tissue regeneration and cancer metastasis and developing medical diagnostic systems. He has published over 100 peer-reviewed journal articles in the area of nanotechnology and biomedical engineering. He is an editor of Scientific Reports, IEEE Transaction on Nanotechnology, IEEE Nanotechnology Magazine, and SLAS Technology. Among other honors, Dr. Wong received the NIH Director's New Innovator Award in 2010, Arizona Engineering Faculty Fellow in 2011, AAFSAA outstanding Faculty Award in 2013, and JALA 10 – A Top 10 Breakthrough in Innovation in 2015. Dr. Wong is a Fellow of the Royal Society of Chemistry (RSC), American Institute of Medical and Biological Engineering (AIMBE), and Society for Laboratory Automation and Screening (SLAS).

Ultrasound and Drug Delivery

KN5: 13:40 - 14:05
Saturday, November 23, 2019
Location: RM 208-210

Hak Jong Lee

Seoul Nat'l Univ. College of Medicine, Seoul, Korea
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Abstract

Ultrasound (US) improves the delivery of therapeutic materials into cells and to modify the vascular permeability causing increased delivery of drugs and drug carriers. It can be used for improving drug distribution due to ultrasound characteristics including heating effect, cavitation, and radiation force.

The combination of nanotechnologies and external ultrasound triggering is providing novel approaches to achieve effective drug delivery. US can be used for releasing local drug from vehicles circulating in the blood, enhancing the extravasation out of vessels, and increasing diffusivity of drugs.

Ultrasound contrast agents, in the form of gas-filled microbubbles, are becoming popular in perfusion monitoring or in the evaluation of vascularity. Stable and inertial cavitations of microbubbles enhance the delivery of therapeutic materials. Besides, they are employed as carrier of therapeutic materials. Drug substances, including genetic therapeutics, can be attached to or incorporated in the microbubble particles for ultrasound-triggered release in the insonated organs and tissues. For the molecular imaging and specific delivery of drug substances, the use of specifically modified microbubbles would be needed.

The use of advanced contrast agents and ultrasound as a tool for increased local gene and drug delivery has an enormous clinical potential, especially in oncology and vascular clinical applications. The encapsulation in microbubbles and subsequent local release, deposition, and potentiation in the target tissue by ultrasound will help improving the therapeutic effects, lower the incidence of side effects, and finally achieve successful therapy.

Short Bio

In 1992, Dr. Lee graduated from Seoul National University and became M.D. Certified. In 1977, he became Radiology board certified by the Korean Radiological Society and received his Master of Science from Seoul National University. Dr. Lee received his Ph.D. from Seoul National University in 2002.

Since 2012, Dr. Lee is Professor at Seoul national University College of Medicine, Seoul National University Budang Hospital. He became Director of the Clinical Trial Center for Medical Device Research at Seoul National University Budang Hospital in 2014. He became Director of the Research Strategy and Management Division in 2016. In 2018, he became Radiology of Section Chief at Seoul National University Bundang Hospital.

Polydopamine Coating and TANNylation: Mussel- and Plant-inspired Biomaterials

KN6: 14:30 – 14:55
Saturday, November 23, 2019
Location: RM 208-210

Haeshin Lee

Korea Advanced Institute of Science & Technology
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Abstract

Catecholamines are found ubiquitously in nature. Wetting-resistant, adhesive foot-pads in mussels, neurotransmitters in the brain, melanin biopigments in the skin and eyes, squid beaks, and insect cuticles are the examples. In materials science, catecholamines have recently attracted significant attentions due to the unparalleled material-independent surface functionalization properties. The most well-known material is poly(dopamine) and other derivatives such as poly(norepinephrine), chitosan-catechol and others will be introduced (1,2). First, I would like to present that the assembly of catecholamine and polydopamine is based on a new inter-molecular interactions known as cation-pi.

Subsequently, my talk will introduce a new concept of self-sealing which is similar yet different with conventional self-healing materials. The first example is vascular self-sealing with rapid binding of intrinsic blood serum proteins to adhesive chitosan-catechol conjugate (3). The

second example is plant-inspired nanoparticle formulation called TAN-Nylation. In this study, we show that the modification of protein and peptide therapeutics with tannic acid—a flavonoid found in plants that adheres to extracellular matrices, elastins and collagens—improves their ability to specifically target heart tissue. Via a simple intravenous injection route, now one can easily delivery protein/peptide therapeutics directly to heart tissues (4). Finally, biomedical applications using polydopamine surface chemistry focusing on mammalian/stem cell culture and theranostic applications will be briefly explained in this talk.

[1] H. Lee et al. Science, 318, (2007) 426-430.
[2] J. Ryu, P. B. Messersmith, H. Lee, ACS Appl. Mater. Interf. 10, (2018), 7521-22
[3] H. Lee et al. Nature Materials. 16, (2017), 147-152
[4] H. Lee et al. Nature Biomed. Eng. 2, (2018), 304-317

Short Bio

Professor Haeshin Lee is currently KAIST Endowed Chair Professor. He received his B.S. degree in Biological Sciences between in 1996. He received his Ph.D. degree at Biomedical Engineering Department, Northwestern University in 2007. He started his professional carrier from 2009 at Department of Chemistry, KAIST. He is also an Associate Editor in Biomaterials Science (RSC). Haeshin Lee invented the first material-independent surface chemistry named 'polydopamine' in 2007, and this study has been cited more than 5,600 times. His total citation is about 22,000 times. He is the founding member of Korea Academy of Science Young Scholars. Some special recognitions and awards are the followings: LG sabbatical fellowship (2016), POSCO Chung-Am young scholar award (2011), KAIST Pioneer Award, (2012), NASA inventor award (2008), and others.

Biological Applications of Engineered Active Matters

KN7: 14:55 – 15:20
Saturday, November 23, 2019
Location: RM 208-210

Hyunjoon Kong

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hjkong06@illinois.edu

Abstract

Active matters capable of converting chemical energy to mechanical energy present unique features such as self-locomotion and self-manipulation. These matters can discover new physics rules and also have potentials to overcome various technical hurdles in biological applications including anti-fouling and molecular/cell therapies. Our group has been working on assembling active matters that modulate molecular transport across biophysical barriers. This talk will highlight some of applications we recently demonstrated. These applications include (1) self-propelling microbubblers that can remove bacterial biofilm in confined spaces and (2) colloidal pumps that can discharge molecular cargos in response to an external stimulus.

Short Bio

Hyunjoon Kong is a professor in the Department of Chemical and Biomolecular Engineering, Carle Illinois College of Medicine, and Pathobiology at the University of Illinois at Urbana-Champaign (UIUC). He also holds affiliation with the Department of Bioengineering, Center for Biophysics and Computational Biology, and Neuroscience Program. He received his engineering education from the University of Michigan at Ann Arbor (Ph. D.) and performed post-doctoral research at the University of Michigan and Harvard University. He joined the University of Illinois in 2007. During the academic life, he received the Scientist Development Grant from the American Heart Association, the Career Award from NSF, Center for Advanced Study Fellowship, UIUC Engineering Dean's Award for Research Excellence, Centennial Scholar, and Promotion Award. He was elected to an American Institute of Medical and Biological Engineering (AIMBE) Fellow. Up to dates, he has published 150 papers in various peer-reviewed journals.

Biomaterial-Mediated Dynamic Nanoscale Presentation of Ligands for Regulating Cellular Behavior

15:20 – 15:35
Saturday, November 23, 2019
Location: RM 208-210

Liming Bian

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Abstract

A wide array of cellular behaviors such as adhesion, spreading, migration, mechanosensing and differentiation are controlled by the dynamic ligation process of surface receptors, such as integrin, to bioactive ligands, such as Arg-Gly-Asp (RGD). The dynamic properties of polymeric biomaterials at molecular level impart significant impact on the cellular behaviors. Developing tunable molecularly-dynamic polymeric biomaterials is highly instrumental to the fundamental investigation on cellular responses to the dynamic cues in extracellular environment. Remote control of adhesive ligand presentation can offer benefits in regulating cell-implant interactions, thereby immune responses or tissue regeneration in vivo. In this talk, I will present a strategy for modulating nanoscale ligand oscillations by adjusting the frequency of an oscillating magnetic field to modulate the adhesion and specialization of stem cells and macrophages. We grafted RGD ligand-bearing superparamagnetic iron oxide nanoparticles (SPIONs) to a substrate via a long flexible linker. We demonstrate that a low oscillation frequency of the magnetic field stimulated the adhesion and differentiation of stem cells as well as the adhesion and M2 polarization of macrophages in vivo. In stark contrast, a high oscillation frequency inhibited the adhesion and differentiation of stem cells and the macrophage adhesion, but promoted M1 polarization of macrophages in vivo. Our system offers the promising potential to manipulate cellular adhesion to implanted biomaterials and their function, such as inflammation or tissue repair.

Short Bio

Bian Liming is currently an associate professor in the Department of Biomedical Engineering at the Chinese University of Hong Kong. Dr. Bian completed his Ph.D. study in Biomedical Engineering at Columbia University in 2009. Dr. Liming Bian then conducted his postdoctoral research in the Department of Bioengineering, the University of Pennsylvania from 2009 to 2012. In 2012, Dr. Bian joined the Chinese University of Hong Kong as an assistant professor. Dr. Bian's research focuses on the development of novel multiscale biomaterials not only for investigating the role of cell microenvironment factors on stem cell behaviors but also for facilitating the regeneration of diseased or injured tissues and organs. Dr. Bian's research work has been published in the leading journals including PNAS, JACS, Nano Letters, Biomaterials, Nature Communications, Science Advances, Advanced Materials, Advanced Functional Materials, Advanced Science, ACS Nano.

Peptide-Based Micelles for Nanomedicine

15:35 – 15:50
Saturday, November 23, 2019
Location: RM 208-210

Eun Ji Chung

Department of Biomedical Engineering
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eunchung@usc.edu

Abstract

Peptide-based micelles are small, organic nanoparticles that have unique properties as a tool for the detection and targeted delivery of therapeutics to diseases including cardiovascular and chronic kidney disease. Through rational design, these nanoparticles have the potential to deliver drugs or signals to report back on disease state, while addressing the limitations of current clinical diagnostic and therapeutic strategies. To this end, we have engineered multimodal micelles that bind to various markers of diseases and incorporated drugs (microRNA, small molecules, peptides) and imaging molecules (NIRF agents, Gd) for therapeutic and diagnostic applications.

For kidney diseases, while small molecule drugs have been proposed as a therapy to manage disease progression, high dosages are often required to achieve therapeutic efficacy, generating off-target side effects, some of which are lethal. To address these limitations, our lab has designed a novel, kidney-targeting peptide amphiphile micelle (KPAM) system toward drug delivery applications. Specifically, KPAMs were found to cross the glomerular filtration barrier and bind to megalin, a multiligand cell surface receptor present on renal tubule cells. When incubated with human kidney proximal tubule cells, KPAMs were found to be biocompatible in vitro and showed higher accumulation in kidneys compared to nontargeted controls in vivo. I will discuss how we can utilize KPAMs for autosomal polycystic kidney disease therapy and their delivery using various routes of administration.

In addition, due to the modularity of micelles and their potential for theranostic ("thera"-peutic + "diag"-nostic) applications, I will also present our efforts in developing microRNA nanotherapeutics for calcification and smooth muscle cell targeting to detect and inhibit atherosclerosis. Such micelles have the potential to be the next generation of nanoparticles with capabilities to bind to specific disease markers of interest, deliver a therapeutic, and monitor the progression and regression of the disease in real-time.

Short Bio

Eun Ji Chung is the Dr. Karl Jacobs Jr. and Karl Jacobs III Early Career Chair and Assistant Professor in the Department of Biomedical Engineering at the University of Southern California, with a courtesy appointment in Chemical Engineering, Medicine, and Surgery. Her laboratory is interested in developing nano- to macroscale biomaterials that can be utilized in medicine. Dr. Chung received her B.A. with honors in Molecular Biology from Scripps College, her Ph.D. from the Department of Biomedical Engineering from Northwestern University, and her postdoctoral training from the University of Chicago. Dr. Chung is a recipient of the NIH K99/R00 Pathway to Independence Award (2015) and the NIH New Innovator Award (2018), and was

named 35 Under 35 from the American Institute of Chemical Engineers (2017), an Emerging Investigator in Biomaterials Science (2017), and a Young Innovator in Nano Research (2018). She also received the Outstanding Young Engineer from the Orange County Engineering Council (2019) as well as the USC faculty mentoring award in 2018.

Point-of-Care Diagnostics for Rapid Malaria Infection Detection and Monitoring

15:50 – 16:05
Saturday, November 23, 2019
Location: RM 208-210

Peter B. Lillehoj

Department of Mechanical Engineering
Department of Biomedical Engineering
Michigan State University
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lillehoj@egr.msu.edu

Abstract

Malaria is one of the deadliest infectious diseases in the world, with 219 million infections and 435,000 deaths in 2017. One of the main barriers towards achieving malaria elimination is the lack of simple, low-cost and rapid diagnostic tools that can accurately detect malaria infection in asymptomatic individuals or monitor infection in children with mild malaria illness. To address these challenges, my lab explores new strategies to create innovative microfluidic and BioMEMS point-of-care platforms that can be used to detect and monitor malaria infection. In this talk, I will present two of these technologies, including a mobile phone-based biosensor for rapid diagnosis and prognosis of cerebral malaria, and a wearable skin patch for blood-free malaria infection detection. The design and fabrication of these devices, as well as experimental results demonstrating their capacity to perform analytical measurements using clinical samples, will be presented. I will conclude by briefly commenting on our efforts to translate these technologies into clinical settings, as well as the future directions of this research and its potential to improve the diagnosis and treatment of malaria patients, with the ultimate goal of reducing malaria-related morbidity and mortality.

Short Bio

Peter B. Lillehoj is an Associate Professor in the Departments of Mechanical Engineering and Biomedical Engineering, and an Adjunct Professor in the Institute for Global Health at Michigan State University (MSU). He received a B.S. degree in Mechanical Engineering in 2006 from Johns Hopkins University and M.S. and Ph.D. degrees in Mechanical Engineering from the University of California, Los Angeles in 2008 and 2011, respectively. Dr. Lillehoj is the director of the Integrated Microsystems Laboratory at MSU, which conducts interdisciplinary research to develop medical microtechnologies for point-of-care testing and global health. He is a recipient of the NSF CAREER Award in 2014, the Wellcome Trust Innovator Award in 2019 and two Grand Challenges Explorations grants from the Bill & Melinda Gates Foundation. He is currently serving as an Editorial Board member for Scientific Reports.

Wearable Systems for Self-Powered Healthcare Applications

16:05 – 16:20
Saturday, November 23, 2019
Location: RM 208-210

Zong-Hong Lin

Institute of Biomedical Engineering
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Abstract

As far as the development of wearable electronics is concerned, power supply has always been the bottleneck to overcome. In our group, we have utilized commercial textiles and proteins/hydrogels to fabricate biocompatible, portable, and lightweight nanogenerators to harvest biomechanical energy from human motions to directly power wearable electrochemical systems for humidity/temperature/sweat detections (ions, glucose, and lactate) and antibacterial applications. In addition, through the functionalization of devices surface, those nanogenerators evolve into self-powered bio(chemical) sensors. They can be triggered directly by biomechanical motions or body heat instead of external power supply. The varied generated electric outputs are observed when those functionalized nanogenerators detect target ions/molecules. With the simplicity (no complex circuitry or power supply involved) and low-cost fabrication process (minimal and low-priced materials required), the developed sensors and systems show their adaptability to be integrated with next-generation smart clothes.

Short Bio

Dr. Zong-Hong Lin is currently an Associate Professor in the Institute of Biomedical Engineering, Adjunct Associate Professor for the Department of Power Mechanical Engineering and Frontier Research Center on Fundamental and Applied Sciences of Matters at National Tsing Hua University in Taiwan. He received his Ph.D. degree in Chemistry from National Taiwan University (2009) and continued his postdoctoral research at NTU and Georgia Institute of Technology (2010-2014). Dr. Lin's research interests focus on the development of self-powered nanosensors and systems for healthcare applications. Dr. Lin is the author of more than 80 SCI papers (Total Citations: 7198, H-index: 43), as well as the inventor of over 20 patents. His research has been recognized by many honors, including Young Investigator Awards of the Asian Biomaterials Congress (2015), the Association of Chemical Sensors in Taiwan (2016), the National Tsing Hua University (2018) and the Taiwan Ministry of Science and Technology (2019). In recent years, Dr. Lin is dedicated to turning his scientific research into commercially viable healthcare applications.

Piezoelectric Nano-Membranes Based Flexible Bio-Integrated Electronics for Biomedical Applications

16:20 – 16:35
Saturday, November 23, 2019
Location: RM 208-210

Xinge Yu

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Abstract

Flexible bio-integrated electronics have attracted great attentions due to the advantages of soft, lightweight, ultrathin architecture, and stretchable/bendable, thus has the potential to apply in various areas, especially in the field of biomedical engineering. By engineering the classes of materials processing and devices integration, the mechanical properties of the flexible electronics can well match the soft biological tissues to enable measuring bio signals and monitoring human body health. Pb(Zr0.52Ti0.48)O3 (PZT) is an excellent piezoelectric material, and exhibits the capability for actuate sensing and actuation in electronics. Since PZT can not only precisely translate mechanical stress/strain to electrical signal, but also create local deformation by inputting electricity. However, the modulus of PZT is over 100 GPa, which is more than 6 orders of magnitudes greater than soft biological tissues. This mechanical mismatch between PZT and bio-tissues is the major challenge that limits its applications in flexible and bio-integrated electronics. In this presentation, the combined strategies in materials processing, mechanical design and device construction for architecturally engineered PZT based flexible biomedical electronics will be discussed. Demonstrations will include a flexible needle-shaped piezoelectric microsystem for tissue pathology biopsies (cancer diagnosis), and soft 3 dimensional microscale devices made from PZT based advanced electronics for bio-fluid measurement.

Short Bio

Xinge Yu is currently an Assistant Professor of Biomedical Engineering at City University of Hong Kong. Xinge Yu received his B.S. in engineering and technology in optoelectronics from the University of Electronic Science and Technology of China (UESTC) in 2009. He finished his Ph.D. research in solution process/printable flexible electronics at Northwestern University and recived his Ph.D. degree in Optical Engineering from UESTC in 2015. From 2015 to 2018, Xinge Yu was a postdoctoral research associate in the Center for Bio-Integrated Electronics at Northwestern University and an adjunct research assistant professor in the Department of Materials Science and Engineering at the University of Illinois at Urbana-Champaign, where he is working on novel flexible and bio-electronics. Now, his research focus on developing flexible electronics and bio-electronics, and conducts multidisciplinary research addressing challenges in practical applications, such as biomedical electronics with compatible physical and chemical properties, and real-time health monitoring. He has published over 50 papers in the top journals, such as Nat. Mater., Nat. Biomed. Eng., PNAS, Sci. Adv., Adv. Mater., etc, and 15 patents pending or granted. Also, he has been serving as a reviewer for over 40 leading journals.

IEEE-NANOMED TECHNICAL SESSION

Smart Sensors for Healthcare Applications

SS1: 12:30 -13:45
Friday, November 22, 2019
Location: RM 208

Session Chair: **Zong-Hong LIN**
National Tsing Hua Univ., Taiwan

Description

Smart sensors with various advantages in comparison to conventional sensors have triggered increasing research efforts from both industry and academia. Many intelligent or medical sensors have shown their capabilities to continually analyze different activities and help to predict diseases before serious conditions happen. And active/self-powered sensors with no external input power, are mini-sized and lightweight. The development of these smart sensors has pushed their feasible applications in a wide range of fields. This session will attempt to cover the recent achievements of smart sensors, which include physical/chemical sensors, biosensors, microfluidics for medical & biological applications, and self-powered sensors/systems.

SS1.1 Micro/nano-structured flexible sensors for healthcare and biomedical applications, Inkyu PARK, Korea Advanced Institute of Science and Technology, Korea (invited)

SS1.2 Self-powered triboelectric sensors, Dukhyun CHOI, Kyung Hee Univ., Korea (invited)

SS1.3 Multifunctional flexible sensor integrated with piezoelectric and triboelectric sensing elements for human motion detection, Junghyo NAH, Chungnam National Univ., Korea (invited)

SS1.4 Body heat harvesting and personal thermoregulation based on thermoelectric devices, Woochul KIM, Yonsei Univ., Korea (invited)

SS1.5 Toward self-powered sensors based on the boosted output power of the triboelectric nanogenerator, Jeongmin BAIK, Ulsan National Institute of Science and Technology, Korea (invited)

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Micro- and Nanoplatforms for Biomedical Applications

SS2: 12:30 -13:45
Friday, November 22, 2019
Location: RM 209

Session Chair: **Kyunghoon KIM**
Sungkyunkwan Univ., Korea

Description

Living systems have sophisticated arsenal of biological molecules such as membrane proteins, ion channels, and pumps. The complex nature of biological organisms complicates our understanding of their cellular functions and biophysical phenomena. Micro- and Nanotechnologies provide unique opportunities for detection and quantification of various biomolecules, cells and cellular organisms, but also enable interfacing between man-made devices and biological systems. This session will be focused primarily on understanding of complex cell behavior and new strategies for emerging biomedical applications such as delivery of drug molecules, DNA extraction, cell therapy and biosensing.

SS2.1 Magnetic biosensors for proteomic and genomic studies, Jung-Rok LEE, Ewha Womans Univ., Korea (invited)

SS2.2 Cell free DNA extraction and its amplification by microfluidic circuit chips with minimal external controllers, Sung-Jin KIM, Konkuk Univ., Korea (invited)

SS2.3 Concentric circular PDMS channels for thrombosis investigation, Woo-Tae PARK, Seoul National Univ. of Science and Technology, Korea (invited)

SS2.4 Detachable microneedles for minimally-invasive sustained drug delivery, WonHyoung RYU, Yonsei Univ., Korea (invited)

SS2.5 Supported lipid bilayer/MoS_2 bioelectronic transistor, Kyunghoon KIM, Sungkunkwan Univ., Korea (invited)

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Stem Cell Stimulating Biomaterials for Regenerative Medicine

SS3: 12:30 -13:45
Friday, November 22, 2019
Location: RM 210

Session Chair: **Soo-Hong LEE**
Dongguk Univ., Korea

Description

The traditional concept of regenerative medicine aims to focus on producing an artificial tissue made from the stem cells and biocompatible 3D scaffolds. However, artificial tissue therapy including stem cells is very challenging to achieve the final goal of their own purpose because they have to satisfy all of the requirement proposed by FDA and also spend time and cost tremendously a lot. Rather than the traditional concept, thus, simple concept using the implantable biomaterials would be getting more attraction as long as the biomaterials are able to help tissue regeneration following stem cells stimulation. It has been reported that so many emerging techniques for biomaterials modification chemically and physically indeed regulates stem cells followed by enhanced tissue regeneration. The proposed session will broadly deal with recent researches about the many types of biomaterials approach stimulating stem cells for tissue regeneration.

SS3.1 Biomaterials for 3D reprogramming and tissue patterning, Seung-Woo CHO, Yonsei Univ., Korea (invited)

SS3.2 Leaf-stacked structure for sustained release of growth factors and improved tissue regeneration, Se Heang OH, Dankook Univ., Korea (invited)

SS3.3 Microfabricated platforms for cancer immunotherapy, Junsang DOH, Seoul National Univ., Korea (invited)

SS3.4 Fabrication of multiscale RNA-based structures for cell reprograming, Jong Bum LEE, Univ. of Seoul, Korea (invited)

SS3.5 Remodeling of collagen matrix by MMP accelerates bone tissue regeneration, Soo-Hong LEE, Dongguk Univ., Korea (invited)

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Field Effect Based Sensor and its Bio-Applications

SS4: 12:30 -13:45
Friday, November 22, 2019
Location: RM 212

Session Chair: **Chao-Sung LAI**
Chang Sung Univ., Taiwan

Description

This session seeks papers that describes studies the sensors by the field effect platforms with novel materials, nano-structures, and integrated system and the biomedical applications. This session broadly encompasses the design, fabrication, and characterization of filed effect platforms, i.e. Field Effect Transistor, Thin-Film Transistor, NanoWire Transistor, and Light Addressable Potential System. In-vitro Diagnostics (IVD), electronic nose, and electronic tongue applications are welcome in this invited session.

SS4.1 Biological interface cell-based biosensors, Ping WANG, Zhejiang Univ., China (invited)

SS4.2 Biologically coupled gate field-effect transistors meet in vitro diagnostics, Toshiya SAKATA, Univ. of Tokyo, Japan (invited)

SS4.3 Effect of the sizes of the sensing targets on the nanowire field effect transistor based biosensors, Yuh-Shyong YANG, National Chiao Tung Univ., Taiwan (invited)

SS4.4 Transistor-nano-sonsors and its clinical aplications, Chao-Sung LAI, Chang Gung Univ., Taiwan (invited)

SS4.5 An integrated assessment platform for anticancer drugs based on a dual functional cell-based biosensor, Xinwei WEI; Chenlei GU; Liujing ZHUANG; Hao WAN; Ping WANG, Zhejiang Univ., China; Chinese Academy of Sciences, China (Paper - 33)

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Functional Organ Mimetics for Drug Discovery

SS5: 12:30 -13:50
Friday, November 22, 2019
Location: RM 213

Session Chair: Joo Han KANG
Tae-Eun PARK
Ulsan National Institute of Science & Technology, Korea

Description

Global R&D Center for Organ Mimetics (GROM) at UNIST was established in 2018 supported by National Research Fund to lead and facilitate the advancement of organ mimetic platform development for drug discovery. With their global partner institutes; 'University of Basel' and 'Wake Forest Institute for regeneration medicine', GROM operates the interdisciplinary and international projects. This session will introduce the recent technologies in organ mimetics developed in GROM and fundamental technologies and applications related to enhanced drug discovery.

SS5.1 In silico approaches in early drug development, Seunghoon HAN, Catholic Univ., Korea (invited)

SS5.2 Preparation and characterization of nanometer-sized mechano-responsive liposomes for physically triggered drug delivery, Sofiya MATVIYKIV, Univ. of Basel, Switzerland (invited)

SS5.3 High-precision 3D bio-dot printing to improve paracrine interaction between multiple types of cell spheroids, Hyun-Wook KANG, Ulsan National Institute of Science and Technology (UNIST), Korea (invited)

SS5.4 Tumor spheroid formation in microfluidics-generated 3D microgels with tunable mechanics, Chaenyung CHA, Ulsan National Institute of Science and Technology (UNIST), Korea (invited)

SS5.5 Mechano-responsive liposomes for physics-based drug delivery, Bert MULLER, Univ. of Basel, Switzerland (invited)

SS5.6 Brain on a chip: a biomimicry of brain microvasculature physiology and disease state, Hong Nam KIM, Korea Institute of Science and Technology (KIST), Korea (invited)

SS5.7 Well plate format vascularized organ on a chip platform, Byungjun LEE, Curiosis Inc., Korea (invited)

SS5.8 Bioinspired microneedles for liquid drug delivery, Hoon Eui JEONG, UNIST, Korea (invited)

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Biofabrication and 3D Tissue Modeling

SS6: 13:50 -15:05
Friday, November 22, 2019
Location: RM 208

Session Chair: Jinah JANG
Sungjune JUNG
Pohang Univ., Korea

Description

3D tissue modeling is an emerging field of investigation for disease mechanisms, drug testing, and therapeutic effects for human survival. Various methods have been developed to recapitulate tissue mimetic microenvironments; however, they could mimic only the fragmentary phase of disease. Basically, cells under 2D substrate are difficult to mimic natural tissue behaviors or arrangements in the body. In this session, we provide cutting-edge biofabrication and relevant techniques for creating 3D in vitro tissue models that can support normal or diseased tissue differentiation, integration, and spatiotemporal reaction by drug treatment or cancer metastasis.

SS6.1 Natural resource-derived biomaterials with 3D printing techniques, Hoon SEONWOO, Sunchon National Univ., Korea (invited)

SS6.2 3D organ-on-a-chip: engineering organ model using cell-printing technology, Hyung Seok LEE, Kangwon National Univ., Korea (invited)

SS6.3 3D modeling of human brain cancer environment for testing advanced anti-cancer treatments, Hee-Gyeong YI, Seoul National University Hospital, Korea (invited)

SS6.4 Decellularized extracellular matrix as a bioink for printing human tissues, Jinah JANG, POSTECH, Korea (invited)

SS6.5 Geant4-based model of a mouse injected with gold nanoparticles for X-ray tomography simulation studies, Sandun JAYARATHNA; Md Foiez AHMED; Sang Hyun CHO, Univ. of Texas MD Anderson Cancer Center, USA (Paper - 17)

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Smart Biomaterials for Bio/Nano-Applications

SS7: 13:50 -15:05
Friday, November 22, 2019
Location: RM 209

Session Chair: Jae Young LEE
Gwangju Institute of Science & Technology, Korea

Description

Functional biomaterials that can exhibit high performances have been widely developed to actively affect biological systems. In particular, bio/nano-applications have received great benefits from such advances in various smart biomaterials. This session will include emerging material-based technologies for various bio/nano-applications, such as imaging, tissue engineering, and drug delivery applications.

SS7.1 Rapid and efficient extracellular vesicle isolation via smart polymer reagents, James J. LAI, Univ. of Washington, USA (invited)

SS7.2 Peptide-based immunological cloaking for efficient in vivo phage therapy, Yoon Sung NAM, Korea Advanced Institute of Science and Technology, Korea (invited)

SS7.3 Multi-functional hydrogel-incorporated nanofiber scaffolds capable of controlled release of growth factors, Won-Gun KOH, Yonsei Univ., Korea (invited)

SS7.4 Biomedical application of polypeptide for cancer therapy, Yeu-Chun KIM, Korea Advanced Institute of Science and Technology (KAIST), Korea (invited)

SS7.5 Remote induction of hydrogelation in vivo for cell delivery, Jae Young LEE, Gwangju Institute of Science and Technology (GIST), Korea (invited)

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Emerging Technologies for Modeling and Diagnosis of Disease States of Human Organs

SS8: 13:50 -15:05
Friday, November 22, 2019
Location: RM 210

Session Chair: Hong Nam KIM
Korea Institute of Science & Technology, Korea

Description

Recapitulating of disease states using an in vitro model and early detection of them using the new devices are the emerging fields in recent bioengineering. Although conventional in vitro models have revolutionized the fundamental biology and medicine, they often could not demonstrate in vivo-like functions due to the limited innate cellular properties, poor cell-cell interactions, and uncontrolled microenvironmental factors. Furthermore, the early detection of the disease state of human tissue have been quite limited due to the low sensitivity and selectivity to the target biomarkers. This session will highlight emerging technologies that can mimic tissue physiology and diagnose the disease states of human tissue using the engineering techniques.

SS8.1 Human iPSC culture via extension of the feeding cycle and inhibition of apoptosis, Hee Ho PARK, Kangwon National Univ., Korea (invited)

SS8.2 Graphene based biosensor for practical diagnosis, Jinsik KIM, Dongguk Univ., Korea (invited)

SS8.3 Designing nanoscale topographical structures for controlled morphology and function of cells, Jangho KIM, Chonnam National Univ., Korea (invited)

SS8.4 Brain on a chip technology for assessing toxicity of airborne ultrafine particulate matter, Hong Nam KIM, Korea Institute of Science and Technology (KIST), Korea (invited)

SS8.5 Chemo-photodynamic theranostic via photo-induced nuclear transport mechanism, Hsiu-Hung HUANG; Cheng-Chung CHANG; Zi-Lun LAI, National Chung Hsing Univ., Taiwan (Paper - 32)

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IEEE-NANOMED TECHNICAL SESSION

Lab-on-a-Chip Systems for Point-of-Care Biosensing Applications

SS9: 13:50 -15:05
Friday, November 22, 2019
Location: RM 211

Session Chair: **Hyungsoon IM**
Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA

Description

This session will cover recent developments of new integrated systems for point-of-care biosensing and clinical applications in various diseases including cancer, cardiovascular disease, malaria, and sepsis.

SS9.1 High-sensitivity POCT immunosensor for the detection of troponin I, Min-Gon KIM, Gwangju Institute of Science and Technology, Korea (invited)

SS9.2 Point-of-care morphology-based malaria diagnostic platform based on automated staining-on-a-chip, digital imaging, and deep learning, Dongyoung LEE, NOUL Inc., Korea (invited)

SS9.3 Microfluidic approaches for sepsis diagnosis and therapy, Joo Hun KANG, Ulsan National Institute of Science and Technology, Korea (invited)

SS9.4 Synthesis of DNA-templated nanomaterials with enhanced fluorescence stability for broad diagnostic application, Ki Soo PARK, Konkuk Univ., Korea (invited)

SS9.5 Deep-learning based digital diffraction diagnostics for point-of-care cancer detection, Hyungsoon IM, Massachusetts General Hospital, USA (invited)

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Microfluidics for Molecular and Cellular Applications

SS10: 13:50 -15:05
Friday, November 22, 2019
Location: RM 212

Session Chair: **Mohammad A. QASAIMEH**
New York University-Abu Dhabi, United Arab Emirates

Description

Microfluidics is a leading technology for transforming and miniaturizing bioassays through leveraging unique phenomena at the micro-and nanoscale. The field of microfluidics is increasingly witnessing involvement of scientists, engineers, and clinicians, and hence resulting in interdisciplinary collaborative efforts. Consequently, the field is continuously leading groundbreaking discoveries in basic sciences and offering progressive solutions to healthcare problems. This session highlights several advances of microfluidics in molecular and cellular applications, including exosome liquid bipsy methods, tissue-on-a-chip platforms, and single cell manipulation devices.

SS10.1 Electrokinetic preconcentration of DNA/RNA and exosomes for enhancing detection speed and sensitivity of liquid biopsy, Yong-Ak SONG, New York University-Abu Dhabi, United Arab Emirates (invited)

SS10.2 Human microvasculatoure on-a-chip, Angela R. WU, Hong Kong Univ. of Science and Technology, Hong Kong (invited)

SS10.3 Leukemia-on-a-chip microsystem for understanding and targeting chemotherapy resistance in B-cell acute lymphoblastic leukemia, Weiqiang CHEN, New York University, USA (invited)

SS10.4 Label-free cell sorting using inertia microfluidics, Majid E. WARKIANI, Univ. of Technology Sydney, Austrailia (invited)

SS10.5 Microfluidic probes for single cell analysis, Mohammad A. QASAIMEH, New York University-Abu Dhabi, United Arab Emirates (invited)

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Regenerative Medicine Using Nano-Technology

SS11: 15:25 -16:40
Friday, November 22, 2019
Location: RM 208

Session Chair: **Jun Sik LEE**
Chosun Univ., Korea

Description

Regenerative medicine provides the opportunities to solve the permanent solution of the treatment of injury and disease, and this field encompasses many disciplines from science and technology fields. Living systems are engineered to subatomic physical and chemical tolerances, and micro- and nanoscale technology has emerged as a key tool to reach the advanced regenerative medicine. In particular, nano-technology can offer the artificial environment to living systems to improve the efficiency of regeneration of tissues and organs or to reveal the important clues of mechanism. This session will be focused on nano-technology-based regenerative medicine, and it would be meaningful for development of new potential applications in regenerative medicine.

SS11.1 Bone forming peptides induces osteogenic differentiation and bone formation; application of adjuvant therapies for bone-related diseases, Jun Sik LEE; Hyung Keun KIM; Jong Keun SEON, Chosun Univ., Korea; Korea Biomedical Innovation Research Center, Chonnam National Univ. Bitgoeul Hospital (CNUBH), Korea; Chonnam National Univ. Hwasun Hospital, (CNUHH), Korea (invited)

SS11.2 Stimuli-sensitive nanomedicine for targeting of anticancer drug delivery, Young-IL JEONG, Pusan National Univ. Yangsan Hospital, Korea (invited)

SS11.3 Evaluation of e-spun nanofibers for barrier membrane application in guided bone regeneration, Chan KIM; Yun Kyong LIM; Joong Ki KOOK; Sang Joun YU; Won Pyo LEE; Kyung Hyun LEE; Seung Hoon LEE, Amogreentech Co., Ltd., Korea; Chosun Univ., Korea; Soongsil Univ., Korea (invited)

SS11.4 ProCartilage adhesive interfaces of pressure film sensor for glenohumeral joint pressure measurement, Yeon Soo LEE; So Yeon WOO, Daegu Catholic Univ., Korea (invited)

SS11.5 Aggregation-induced emission fluorogens-doped silica nanoparticles using for cellular imaging, Chin-Wei LAI; Cheng-Chung CHANG (Paper - 26)

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Novel Sensors and Materials

SS12: 15:25 -16:40
Friday, November 22, 2019
Location: RM 209

Session Chair: **Aaron T. OHTA**
Univ. of Hawaii, Hawaii, USA

Description

This session covers a range of novel sensors and materials for biomedical applications, such as wearable sensors and materials for flexible electronics.

SS12.1 Utilization of a gallium based liquid metal for flexible micro-devices, Soonmin SEO, Gachon Univ., Korea (invited)

SS12.2 Biochip on skin: wearable sweat sensor, Jungil CHOI, Kookmin Univ., Korea (invited)

SS12.3 Three-dimensional helical nanostructures for miniaturized sensors and actuators, Gilgueng HWANG, Centre for Nanoscience and Nanotechnology, French National Center for Scientific Research (CNRS), Univ. Paris-Sud, France; Laboratory for Integrated Micro Mechatronic System, Univ. of Tokyo, Japan (invited)

SS12.4 Liquid-metal reconfigurable circuits, Aaron T. OHTA, Univ. of Hawaii at Manoa, USA (invited)

SS12.5 Graphene quantum dots as probes in electrochemical immunoassay for rapid and sensitive detection of *Staphylococcus aureus*, Vedashree V. SIRDESHMUKH; Harshika R. APTE; Anup A. KALE, MIT-World Peace Univ., India (Paper - 18)

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Emerging Science and Technology for Next Generation Medical Society

SS13: 15:25 -16:40
Friday, November 22, 2019
Location: RM 210

Session Chair: **Chang-Soo LEE**
Chungnam National Univ., Korea

Description

An interaction with biological molecules at nanoscale opens up novel science and engineering in a vast field of research and application. Interactions between artificial molecular assemblies and biomolecules can be understood both in An interaction with biological molecules at nanoscale opens up novel science and engineering in a vast field of research and application. Interactions between artificial molecular assemblies the extracellular medium and inside the human cells. Its application to technology is expected to bring new ways to improve our life. This session highlights emerging issues for biomedical applications.

SS13.1 Preparation of in situ injectable chitosan/gelatin/nanohydroxyapatite hydrogel using a marine-derived acid-tolerant tyrosinase, Yoo Seong CHOI, Chungnam National Univ., Korea (invited)

SS13.2 Carbon monoxide-releasing supramolecular hydrogel, Eunji LEE, Gwangju Institute of Science and Technology, Korea (invited)

SS13.3 Triple emulsion-templated microcapsules enveloping an ultra-thin liquid layer: high loading efficiency and cargo diversity, Chang-Hyung CHOI, Daegu Haany Univ., Korea (invited)

SS13.4 Scale-up of microfluidics for monodisperse droplet/bubble production via parallelization, Heon-Ho JEONG, Chonnam National Univ., Korea (invited)

SS13.5 Culture-based omics approaches in biostimulants and food microbiomes: oldies but goodies?, Woo-Suk CHANG, Univ. of Texas at Arlington, USA (invited)

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Microfluidic System for Bio-Medical Applications I & II

SS14-1: 15:25 -16:40
Friday, November 22, 2019
Location: RM 211

Session Chair: Da-Jeng YAO
National Tsing Hua Univ., Taiwan

Description

Single cell analysis and tissue engineering would be very important field for the study of the relationship between sensing results and diseases. Furthermore, mobile diagnostics and personal healthcare would be one of potential hot topics and applications in the world. Those topics will be presented in this invited sessions.

SS14-1.1 Nanohybrid hydrogel containing glycosaminoglycan-based polyelectrolyte nanoparticles for the treatment of stroke, Tzu-Wei WANG, National Tsing Hua Univ., Taiwan (invited)

SS14-1.2 Microfluidic chip for single-cell interaction analysis, Chia-Hsien HSU, National Health Research Institutes, Taiwan (invited)

SS14-1.3 Beyond the debye length and ideal Nernst sensitivity for FET sensors: from fundamental breakthrough to real applications for mobile diagnostics and personal healthcare, Yu-Lin WANG, National Tsing Hua Univ., Taiwan (invited)

SS14-1.4 Adolase triggers metabolic reprogramming in colorectal cancer in hpoxia and stiff desmoplastic microenvrionments, Chi-Shuo CHEN, National Tsing Hua Univ., Taiwan (invited)

SS14-1.5 System model for tracking in vivo nanoswimmers using Kalman filter for nanobiomedicine, Zheng GONG; Yifna CHEN; Shaolong SHI; Xiaoyou LIN; Michael J. CREE; Neda SHARIFI, Univ. of Waikato, New Zealand; Southern Univ. of Science and Technology, China (Paper - 15)

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SS14-2: 16:45 -18:00
Friday, November 22, 2019
Location: RM 212

Session Chair: Da-Jeng YAO
National Tsing Hua Univ., Taiwan

SS14-2.1 Platelet concentrate preparation using taylor-couette filter, Yen-Wen LU, National Taiwan Univ., Taiwan (invited)

SS14-2.2 Fabrication of quasi-3D microfluidic model for geographic and biological analysis by simple micromiller, Chia-Wen TSAO, National Central Univ., Taiwan (invited)

SS14-2.3 EWOD on in vitro fertilization (IVF) and embryo diagnositcs, Yao-Hsien HUANG; Yi-Wen WANG; Hong-Yuan HUANG; Da-Jeng YAO, Chang Gung Memorial Hospital, Taiwan; National Tsing Hua Univ., Taiwan (invited)

SS14-2.4 Optimization of sustained-releasing alginate microcarriers encspsulated of doxorubicin, C.T. Pan; Y.L. Shiue; S.C. Shen; C.K. Yen; S.Y. Wang; C.J. Yang, National Sun Yat-sen University; National Cheng Kung University, Taiwan (invited)

SS14-2.5 Model predictive control strategy for navigating nanoswimmers in blood vessels of taxicab geometry, Neda SHARIFI; Yifan CHEN; Geoffrey HOLMES; U Kei CHEANG; Zheng GONG, Univ. of Waikato, New Zealand (Paper - 16)

SS14-2.6 Development of a microfluidic chip for 3D cancer cell migration assay, Chun-Chih YEH; Andrew GOH; Kin Fong LEI, Chang Gung Univ., Taiwan (Paper - 21)

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Nanomaterials for Medicine

SS15: 16:45 -18:00
Friday, November 22, 2019
Location: RM 213

Session Chair: Won Jong KIM
Pohang Univ., Korea

Description

Since the advent of nanotechnology, there has been a tremendous growth in this field of nano-bio-technology. Many products introduced into the market are based on nano-bio-technology and are useful to environment monitoring, rapid diagnostics, diseases monitoring, diseases management, and personalized health care. This session will cover the most recent developments in the field of Nanobiotechnology and Nanomedicine. We will share complete overview on the state of the art in these fields and on the research carried out and the latest results. Recent advances, difficulties and breakthroughs as well as emerging and future trends of the converging fields of Nanotechnology, Biotechnology and Medicine will be discussed.

SS15.1 Fluorescent sensors for continuous glucose monitoring, Yun Jung HEO, Kyung Hee Univ., Korea (invited)

SS15.2 Formulation of biomedical nanoassembly for anti-cancer therapy and anti-inflammation, In-Kyu PARK, Chonnam National Univ. Medical School, Korea (invited)

SS15.3 Microfluidic human BBB-on-a-chip, Tae-Eun PARK, Ulsan National Institute of Science and Technology, Korea (invited)

SS15.4 Coacervate-embedded interpenetrating network composite hydrogels for cartilage tissue regeneration, Kyobum KIM, Incheon National Univ., Korea (invited)

SS15.5 Preparation and characterizations of siloxane-based organosilica nanoparticles for theranostic applications, Hansoo PARK, Chung-Ang Univ., Korea (invited)

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Externally Triggered or Image Guided Therapy Using Nanoparticles

SS16: 16:45 -18:00
Friday, November 22, 2019
Location: RM 208

Session Chair: Hyuncheol KIM
Sogang Univ., Korea

Description

Photodynamic therapy (PDT) and sonodynamic therapy (SDT) are emerging and innovative technology using nanoparticles. External energies such as laser or ultrasound can trigger the nanoparticles inside the body, and the energies can excite specific portions of our organ. The excited nanoparticles can release reactive oxygen species (ROS) in the tissue and evoke immunogenic cell death. In this session, several innovative technologies using nanoparticles in the field of externally triggered or image guided therapy will be introduced.

SS16.1 Combination of chemotherapy and photodynamic therapy for cancer treatment with sonoporation effects, Hyuncheol KIM, Sogang Univ., Korea (invited)

SS16.2 H_2O_2-activatable particles for imaging and targeted therapy of oxidative stress-associated diseases, Dongwon LEE, Chonbuk National Univ., Korea (invited)

SS16.3 Nanoparticle application for MRI: beyond imaging, Seung Hong CHOI, Seoul National University College of Medicine, Korea (invited)

SS16.4 Stimuli-responsive polymer nanomedicines for ROS-mediated cancer therapy, Jae Hyung PARK, Sungkyunkwan Univ., Korea (invited)

SS16.5 Sonocatalytic generation of reactive oxygen species from nanobubble-trapping titanium dioxide nanocones with potential for targeted cancer therapy, Reju G. THOMAS; Vishal J. KAKKARAKUNNEL; Catarina V.G. DUARTE; Jong-Min LEE; Kee Woei NG; James Jing KWAN, Chonnam National Univ. Medical School, Korea; Nanyang Technological Univ., Singapore (invited)

Advances in Bio/Nano Medicine: Nanoagents and Sensing Platforms

SS17: 16:45 -18:00
Friday, November 22, 2019
Location: RM 209

Session Chair: **Haewook HAN**
Pohang Univ. of Science & Technology, Korea
Jin-Woo KIM
Univ. of Arkansas, USA

Description

This session will focus on the recent advances in the design, fabrication and characterization of theranostic nanoagents as well as imaging and sensing platforms in bio/nano medicine.

SS17.1 Programmable Molecular/Nanoscale Building Blocks for Nano/Bio-Hybrid Materials in Bio/Nano Medicine, Jin-Woo KIM, Univ. of Arkansas, USA (invited)

SS17.2 Radionuclide mediated stimulation of photodynamic agents for precision phototherapy, Nalinikanth KOTAGIRI, Univ. of Cincinnati, USA (Invited)

SS17.3 Silicon-based biochemical sensor for point-of-care application, Hyeonsu CHO; Chang-Ki BAEK, Pohang Univ. of Science & Technology, Korea (Invited)

SS17.4 Microfabricated observation chamber for diffracted X-ray tracking method to capture ion-channel gating motion at time-lapse images, Yoshikazu Hirai, Kyoto Univ., Japan (Invited)

SS17.5 THz spectroscopy for bio/nano molecular analyses, Haewook HAN, Pohang Univ. of Science & Technology, Korea (Invited)

Microsystems Technology

SS18: 16:45 -18:00
Friday, November 22, 2019
Location: RM 210

Session Chair: **Siyuan HE**
Ryerson Univ., Canada

Description

This session includes papers describing MEMS devices such as micromirrors, micro fluidic chips, biochips, and gas sensors, including their fabrication, characterization, and control.

SS18.1 Thin film transistors as an electrical interface to cells, Hiroshi TOSHIYOSHI; Satoshi IHIDA; Agnes TIXIER-MITA, Univ. of Tokyo; Sharp Corporation, Japan (invited)

SS18.2 FPCB mirror technology, Siyuan HE, Ryerson Univ., Canada (invited)

SS18.3 Nonlinear control of MEMS micromirror based on sliding mode control technique, Hui CHEN, Henan Univ., China (invited)

SS18.4 System design and nonlinear control of torsion micromirror, Yi QIN, Dongguan Univ. of Technology, China (invited)

SS18.5 Gas sensing capacitance micromachined ultrasound transducers (CMUTs), John T.W. YEOW, Univ. of Waterloo, Canada (invited)

SS18.6 Single droplet jetting mechanism based on parallel travelling surface acoustic waves, Yulin LEI; Hong HU; Junlong HAN; Qingyun HUANG; Xiaoqing YANG, Harbin Institute of Technology, China (Paper - 56)

Nanotechnologies for Medical Application

SS19: 10:25 -11:40
Saturday, November 23, 2019
Location: RM 211

Session Chair: **Wonbong LIM**
Chosun Univ., Korea

Description

This session will highlight emerging nanotechnologies that can apply to the treatment of various systemic disease and cancer. These approaches will provide novel insights into developing new strategies for various applications on regenerative medicine and drug delivery for acceleration of treatment of disease.

SS19.1 Myeloid-lineage bone marrow cells as a therapeutic target for nano-carriers, Serk In PARK, Korea Univ. College of Medicine, Korea (invited)

SS19.2 A novel photosensitizer for head and neck squamous cell carcinoma therapy, Okjoon KIM, Chonnam National Univ., Korea (invited)

SS19.3 Ellagic acid attenuates extracellular acidity-induced cancer cell invasion via suppression of PLA2/COX2/PGE2 axis, Song Iy HAN, Chosun Univ., Korea (invited)

SS19.4 A recurrent mutation in KCNQ4 in Korean families with nonsyndromic hearing loss and rescue of the channel activity by KCNQ activators, Dong Hoon SHIN, Yonsei Univ., Korea (invited)

SS19.5 Immunotherapeutic treatment of osteoporosis by RANKL modification, Wonbong LIM, Chosun Univ., Korea (invited)

Intelligent Micro/Nanomaterial for Biomedical Application

SS20: 10:25 -11:40
Saturday, November 23, 2019
Location: RM 212

Session Chair: **Hak-Joon SUNG**
Yonsei Univ., Korea
Su Ryon SHIN
Harvard Medical School, USA

Description

Recent advances in the rational design and synthesis of intelligent micro/nano biomaterials for various biomedical and biological applications have led to the diagnosis, treatment, or prevention of diseases or abnormal physical conditions without strong immune rejection in the body. Polymeric and metallic biomaterials are substances that are engineered to be suitable for interaction with a biological system for tissue/organ remodeling and regeneration. This session highlights recent advances in the field of nano/micro biomaterials design and the state of the art in fabrication technologies for developing various biomedical devices such as nanovesicles, smart coating systems, biomimetic tissue constructs, controlled drug delivery platforms, and biosensing systems.

SS20.1 MSC nanovesicles navigate disturbed flow sites and prevent vascular stenosis, Hak-Joon SUNG, Yonsei Univ. College of Medicine, Korea (invited)

SS20.2 Smart antibiofouling coatings for biomedical implants, Jungmok SEO, Yonsei Univ., Korea (invited)

SS20.3 Biomanufacturing of complex tissue constructs with 3D printing technologies, Ting ZHANG, Tsinghua Univ., China (invited)

SS20.4 Multifunctional applications of ZnO tetrapod nanomaterials, Yogendra Kumar MISHRA, Kiel Univ., Germany (invited)

SS20.5 Bio-functional microneedle patches for controlled transdermal drug delivery and biosensing, Seung Yun YANG, Pusan National Univ., Korea (invited)

Multidisciplinary Approaches for Nanomedicine

SS21: 10:25 -11:40
Saturday, November 23, 2019
Location: RM 213

Session Chair: **Hoon SEONWOO**
Sunchon National Univ., Korea

Description

Nowadays, biomedical engineering field shows brilliant growing. One of main driving forces of their development is the active collaboration studies between distinct disciplines. The studies, called multidisciplinary studies, give rise a new chance for new observations and insights. Herein,

we will talk about medicines with various perspectives, such as bio-/nano-materials, metabolomics, biomechanics, and mathematical modeling. These talks will give you wider viewpoints and new chances for creative researches.

SS21.1 Introduction of nanotechnologies for advanced tissue engineering, Hoon SEONWOO, Sunchon National Univ., Korea (invited)

SS21.2 Metabolomic study in cells following treatment of silica-coated magnetic nanoparticles, Man Jeong PAIK, Sunchon National Univ., Korea (invited)

SS21.3 Biomechanics of the aortae with captpril treatment in elastin-null mice, Jungsil KIM, Sunchon National Univ., Korea (invited)

SS21.4 Investigating a protein-ligand interaction using molecular surface described by three-dimensional Zernike descriptors, Woong-Hee SHIN, Sunchon National Univ., Korea (invited)

SS21.5 Serine/threonine kinase MLK4 determines mesenchymal identity in glioma stem cells in an NF-κB-dependent manner, Sung-Hak KIM, Chonnam National Univ., Korea (invited)

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Molecular Engineering in Medicine

SS22: 10:25 -11:40
Saturday, November 23, 2019
Location: RM 214

Session Chair: **Tae Hyeon YOO**
Ajou Univ., Korea

Description

Designing and engineering new molecules ranging from small chemicals to macromolecules, including both natural and synthetic polymers, has played in essential roles in not only developing novel therapeutics but also expanding the scope of medicine. This session covers recent representative works of molecule engineering in medicine which encompasses various research topics of molecular design, organic synthesis, microfluidics, protein engineering, and bioconjugation.

SS22.1 Development of molecular probe and theragnostic tool targeting mitochondria, Eunha Kim, Department of Molecular Science and Technology, Korea (invited)

SS22.2 Nanostuctured-based digital molecular diagnosis, Kyoung G. LEE, National NanoFab Center, Korea (invited)

SS22.3 Fighting against bacterial infections with peptidomimetic compounds, Jiwon SEO, Gwangju Institute of Science and Technology, Korea (invited)

SS22.4 Engineering antibodies and biomedical proteins for next general immunotherapy, Sang Taek JUNG, Korea Univ., Korea (invited)

SS22.5 Generation of site-specifically conjugated IgGs via a simple photocrosslinking reaction, Tae Hyeon YOO, Ajou Univ., Korea (invited)

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Clinical Diagnostics and Treatment

SS23: 10:25 -11:40
Saturday, November 23, 2019
Location: RM 208-210

Session Chair: **Kin Fong LEI**
Chang Gung Univ., Taiwan

Description

Based on the mature development of microfabrication and microfluidics technology, micro systems became a powerful tool for various clinical analysis in recent years. A lot of demonstrations related to biomedical applications have been reported because of their advantages associated with miniaturization, automation, sensitivity, and specificity. The invited session recruited 5 experts to share their recent developments on clinical diagnostics and treatment using microfluidic technology.

SS23.1 Tackle antibiotic resistance with magnetic digital microfluidics, Kanitthamniyom POJCHANUN; Yi ZHANG, Nanyang Technological Univ., Singapore (invited)

SS23.2 Regulation of cancer stem cells using polyelectrolyte multilayer nano-film system, I-Chi LEE; Fadera SIAKA, Chang Gung Univ., Taiwan (invited)

SS23.3 Applications of multifunctional nanoprobes on diagnostics and treatment of Alzheimer's Disease, Kwun Hei HO; Jiuhai WANG; Mo YANG, Hong Kong Polytechnic Univ., Hong Kong (invited)

SS23.4 Plasmonic nanostructures for biomedical applications, Wing Cheung LAW, Hong Kong Polytechnic Univ., Hong Kong (invited)

SS23.5 Creating an artificial aneurysm model for professional medical surgery training, Pin-Chuan CHEN, National Taiwan Univ. of Science and Technology, Taiwan (invited)

SS23.6 Micro polymer thermal bonding using boiling point control system, Taehyun PARK, Kyungnam Univ., Korea (invited)

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Emerging Nanotechnology for Biomedical Imaging

SS24: 16:45 -18:00
Saturday, November 23, 2019
Location: RM 211

Session Chair: **Myungsun KIM**
Chonnam National Univ. Medical School & Hospital, Korea

Description

Nanotechnology-based biomedical imaging has gained great interest in the scientific fields for non-invasive deep tissue imaging with high-resolution. In particular, biomedical imaging lies at the basis of the research for clinical decisions, and high precision and sensitive imaging in early time are required for the promising imaging technology. The convergent of nanotechnology and biomedical imaging play an increasingly important role in providing essential factors, and it can be used for innovative diagnosis and therapy. In this session, we will cover the emerging nanotechnology in the field of biomedical imaging, and we will discuss about the state of the art in this field.

SS24.1 Molecular imaging for early detection of immunogenic cell death during anticancer treatment, Jung-Joon MIN, Chonnam National Univ. Medical School, Korea (invited)

SS24.2 Quantum dots for imaging and scintillation, Sungjee KIM, Pohang Univ. of Science & Technology (POSTECH), Korea (invited)

SS24.3 Development of novel biomedical imaging probes for PET, Dong-Yeon KIM, Chonnam National Univ. Medical School, Korea; Hwasun Hospital, Korea (invited)

SS24.4 Molecular photoacoustic imaging for deep tissue visualization using nickel (II) dithioloene-containing polymeric nanoparticles, Changho LEE, Chonnam National Univ. Medical School, Korea; Hwasun Hospital, Korea (invited)

SS24.5 Image segmentation of Zona-ablated human blastocysts, Md Yousuf HARUN; M. Arifur RAHMAN; Joshua MELLINGER; Willy CHANG; Thomas HUANG; Brienne WALKER; Kristen HORI; Aaron T. OHTA, Univ. of Hawaii at Manoa, USA (Paper - 4)

SS24.6 Inner cell mass and trophectoderm segmentation in human blastocyst images using deep neural network, Md Yousuf HARUN; Thomas HUANG; Aaron T. OHTA, Univ. of Hawaii at Manoa, USA (Paper - 5)

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Biomedical Devices with Nanotechnology

SS25: 16:45 -18:00
Saturday, November 23, 2019
Location: RM 212

Session Chair: **Yong Bin CHOY**
Seoul National Univ., Korea
Chun Gwon PARK
Sungkyunkwan Univ., Korea

Description

Biomedical devices have been actively studied towards the goal into clinical applications in the era of sensors, diagnostics, therapies, etc. Recently, biomedical devices are featured with nanotechnology to enhance performances and provide with multi-functionalities. This session will introduce the recent highlights of biomedical devices equipped with state-of-the-art nanotechnologies.

SS25.1 Enhanced angiogenic paracrine factor secretion from human stem cells triggered by organic light emitting diode, Suk Ho BANG, Sungkyunkwan Univ., Korea (invited)

SS25.2 Nanomaterial-modified functional platforms for nondestructive monitoring of stem cell differentiation, Tae-Hyung KIM, Chung-Ang Univ., Korea (invited)

SS25.3 Bioresorbable nano-electronics for non-pharmacological nerve regeneration, Seung-Kyun KANG, Seoul National Univ., Korea (invited)

SS25.4 Harnessing long-lived emission of luminescent silicon nanoparticles for high-contrast fluorescent imaging, Jinmyoung JOO, Ulsan National Institute of Science and Technology, Korea (invited)

SS25.5 Batteryless, implantable devices for on-demand and pulsatile drug delivery, Young Bin CHOY, Seoul National Univ. College of Medicine, Korea (invited)

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Human-Plus Augmented Sensing and Smart Carbon and Colloidal Materials for Enhanced Property

SS26: 16:45 - 18:00
Saturday, November 23, 2019
Location: RM 213

Session Chair: **Hyun Ho LEE**
Myongji Univ., Korea

Description

Recently, there has been an early head-up for novel platform technology designed for augmented sensing property based on human sensory mechanism and enhanced physical property based carbon or colloidal smart materials. The augmented properties are expected to be implemented on futuristic applications including nano-biosensor, nano-medicine, and green chemistry. Hereby, in this session, fundamental platform technologies will be deeply discussed, and material issues behind the novel platforms will be elucidated in details. In addition, cooperative and integrative research boundaries can be induced and invented.

SS26.1 Augmented bioelectronics sensor for taste measurement, Hyun Ho LEE, Myongji Univ., Korea (invited)

SS26.2 Light-cleavable hydrogels and their applications to biosensors, Dong-Sik SHIN, Sookmyung Women's Univ., Korea (invited)

SS26.3 Behavior of polyelectrolyte-coated nanoparticles in high salinity aqueous media, Joohyung LEE, Myongji Univ., Korea (invited)

SS26.4 Layer-by-layer smart carbon thin film for enhanced performance, Yong Tae PARK, Myongji Univ. (MJU), Korea (invited)

SS26.5 High performance graphitic carbon from waste polyethylene: thermal oxidation as a stabilization pathway revisited, Dalsu CHOI, Myongji Univ. (MJU), Korea (invited)

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Electrostatic Interactions and in Drug Delivery and Biomedical Applications

SS27: 16:45 -18:00
Saturday, November 23, 2019
Location: RM 214

Session Chair: **Eun Ji CHUNG**
Univ. of Southern California, USA

Description

Electrostatic interactions need to be considered to optimize drug release and drug interactions with charged, biological components. In addition, incorporating electrostatic interactions into materials can also be used as a strategy that affords properties that are reversible, highly tunable and dynamic, and as such, has become an exciting new direction in the field of engineered biomaterials. The reliance on specific, non-covalent interactions affords opportunities in developing materials with "smart" functionality and activity that can be tuned in response to disease or application. In this session, how electrostatic interactions can be used to control, augment, or tailor drug delivery will be considered. Their relevance in in vitro up through the clinical setting will be discussed.

SS27.1 Bioelectricity for targeted drug delivery to avascular tissues, Ambika BAJPAYEE, Northeastern Univ., USA (invited)

SS27.2 Engineered thermoresponsive polyelectrolyte complex micelles, Lorraine LEON, Central Florida Univ., USA (invited)

SS27.3 Surface modified cellulose nanocrystals for d3ug polymorph screening, Blair BRETTMAN, Georgia Tech, USA (invited)

SS27.4 Functional nano-coatings for nanomedicine, Jinkee HONG, Yonsei Univ., Korea (invited)

SS27.5 A novel micro-groove impedance sensor for antineoplastic drug assessment based on 3D cell, Yuxiang PAN; Yong QIU; Deming JIANG; Hao WAN; Ping WANG, Zhejiang Univ., China (Paper - 22)

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Biomaterials and Biosensors in Biomedical Application

SS28: 16:45 -18:00
Saturday, November 23, 2019
Location: RM 208-210

Session Chair: **Yu-Jui (Ray) FAN**
Taipei Medical Univ., Taiwan

Description

In recent years, a great deal of focus has been aimed to engineer biomaterial-based cues, both at the micro/nano scales, and biosensors with applied perspectives for target applications in different bio- and non-bio sectors of the modern world. The key scientific advancements in biomedical area, have presented next generation concepts related to biomaterials. Use of property designed and structured materials, allows for the development of well-defined sensing prototype that supports a series of directed events. For these reasons, we are pleased to launch the invited session and the issue is focused on "biomaterials and biosensors in biomedical application".

SS28.1 Structure-property-processing and phase transformation of regenerated spider silk polymers, Jen-Chang YANG, Taipei Medical Univ., Taiwan (invited)

SS28.2 Nanomedicine as eye drops for corneal related disease treatment, Ching-Li TSENG, Taipei Medical Univ., Taiwan (invited)

SS28.3 Mechanisms of systeine conjugated gold nanoclusters in *Eschericihia coli*, Tsung-Rong KUO, Taipei Medical Univ., Taiwan (invited)

SS28.4 Conductive polymer coated with functionally amphiphilic polymer forming nanoparticle used in biomedical application, Er-Yuan CHUANG, Taipei Medical Univ., Taiwan (invited)

SS28.5 Polymer-stabilized cholesteric thin-films biosensors, Yu-Cheng HSIAO, Taipei Medical Univ., Taiwan (invited)

SS28.6 Detection of microorganism by portable electrochemical sensors, Yu-Jui (Ray) FAN, Taipei Medical Univ., Taiwan (invited)

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Nanomedicine and Nanoscale Drug Delivery (NND)

SS29: 09:00 -10:15
Sunday, November 24, 2019
Location: RM 208

Session Chair: **Yong-kyu LEE**
Korea Univ., Korea
Dong-Wook HAN
Pusan National Univ., Korea

Description

Nanoscale functional biomaterials with outstanding therapeutic activity have been widely developed for diverse biomedical applications. In particular, these smart nanomaterials can offer greater benefits including site specific active targeting, In situ stimuli responsive cumulative drug release with simultaneous biomedical imaging. This session aim to discuss the emerging material-based technologies for various biomedical applications including stimuli responsive biomedical imaging, tissue engineering and drug delivery.

SS29.1 New thermogelling glycol chitosan biomaterials and their biomedical applications reagents, Kang Moo HUH, Chungnam National Univ., Korea (invited)

SS29.2 Milk protein-shelled gold nanoparticle to treat glioblstoma multiforme, Dong Yun LEE, Biopharmaceutical Human Resource Training and Research Team, Korea; Institute of Nano Science & Technology (INST), Korea; Hanyang University, Korea (invited)

SS29.3 Non-invasive transdermal nanomedicine using hyaluronate derivatives, Ki Su KIM, Pusan National Univ., Korea (invited)

SS29.4 Multifaceted biomedical applications of functional graphene nanomaterials, Dong-Wook HAN, Pusan National Univ., Korea (invited)

SS29.5 Hypoxia mitigating oxygenic manganese oxide nanoconstructs for detection and reduction of cancer, Yong Kyu LEE, Korea National Univ. of Transportation, Korea (invited)

SS29.6 Therapeutic cancer vaccination using nanoparticle-releasing microneedles, Ji Hoon JEONG, Sungkunkwan Univ., Korea (invited)

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Micro/Nanofluidic Bioanalysis/Synthesis with New Technology

SS30: 09:00 -10:15
Sunday, November 24, 2019
Location: RM 209

Session Chair: Liang ZHAO
Univ. of Science and Technology, China

Description

This session focused on the recently emerged technologies which can be combined with micro/nanofluidic device for bioanalysis/synthesis. These new methods could provide promising advantages such as Label-free detection, superior sensitivity, and uniformly controlling of reaction kinetics, allowing researchers to develop new assays for studying cellular biology, immunology, and pharmaceutical development. Such new approaches involving but not limited to nanofluidic, 3D-printing, label-free analysis, and partitioned picolitre reaction.

SS30.1 Microfluidic based cell spheroids analysis, Liang ZHAO, Univ. of Science and Technology, China (invited)

SS30.2 Enhanced bioanalysis on nanofluidic device, Chen WANG, China Pharmaceutical Univ., China (invited)

SS30.3 Microfluidic platform for the nanomedicines synthesis and their anti-tumor effects, Yujin SONG, Univ. of Science and Technology, China (invited)

SS30.4 Digital nucleic acid quantification with large dynamic range: the SlipChip approaches, Feng SHEN, Shanghai Jiao Tong Univ., China (invited)

SS30.5 3D-printed modular magnetic digital microfluidic platform for bioanalysis, P. KANITTHAMNIYOM, A. Adnan Bin FIRDAUS, H. Ali LOCKHAND, R. KUMAR, and Y. ZHANG (Paper - 7)

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From DNA to Smart Materials for Biosensing Applications

SS31: 09:00 -10:15
Sunday, November 24, 2019
Location: RM 211

Session Chair: Jung Heon LEE
Sungkyuunkwan Univ., Korea

Description

In this session, we discuss novel strategies to use small molecules, like DNA and peptides, and smart materials for diverse levels of biosensing applications.

SS31.1 Human interaction electronic devices, Srinivas GANDLA; Jung Joon LEE; Sunju KANG; Hyeok Ju CHAE; Yoo Chan WON; Sunkook KIM, Sungkyunkwan Univ., Korea (invited)

SS31.2 One-dimensional nano-transducers and their interface modifications for biosensor applications, Hyeonseok YOON, Chonnam National Univ., Korea (invited)

SS31.3 Electrochemical biosensors with nanointerface for the detection of pre- & post-diabetic and cardiac biomarkers, John BOSCO BALAGURU RAYAPPAN, Centre for Nanotechnology & Advanced Biomarkers; SASTRA Deemed Univ., India (invited)

SS31.4 Microscopic DNA sequence analysis, Kyubong JO, Sogang Univ., Korea (invited)

SS31.5 Chemical functionalization of carbon nanotubes using DNA binding peptides for biomedical applications, Jung Heon LEE, Sungkunkwan Univ., Korea (invited)

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Extracellular Vesicles for Nanomedicine

SS32: 09:00 -10:15
Sunday, November 24, 2019
Location: RM 212

Session Chair: T.N.Minh. LE
National Univ. of Singapore, Singapore

Description

This session features the emerging applications of natural extracellular vesicles (EVs) in nanomedicine, including the use of EVs as biomarkers, the isolation of EVs with endogenous therapeutic properties and the development of new drug carriers using EVs. We will discuss the following: the classification of EV types; standard methods to purify and characterize EVs; approaches to develop their applications in drug delivery, diagnosis and therapies.

SS32.1 Membrane curvature and lipid composition sensors targeting extracellular vesicle, Hang Hubert YIN, Tsinghua Univ., China (invited)

SS32.2 Isolation and engineering of extracellular vesicles from human red blood cells for cancer therapies, T.N.M. LE, National Univ. of Singapore, Singapore (invited)

SS32.3 Low-pass whole-genome sequencing of circulating tumour DNA and extracellular vesicle DNA reveals molecular drivers of disease in a breast cancer patient, Katie L. MEEHAN, Chinese Univ. of Hong Kong, Hong Kong (invited)

SS32.4 Biosensing exosomal MCT1 and CD147 in tracking metabolic status and malignancy of glioma, Youngjin LEE, City Univ. of Hong Kong, Hong Kong (invited)

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Devices and Systems for Medical Applications

SS33: 09:00 -10:15
Sunday, November 24, 2019
Location: RM 213

Session Chair: Yunlong ZI
Chinese Univ. of Hong Kong
Hong Kong SAR

Description

Progress of medical treatment relies on the advances of related devices and systems. In the past several decades, the general trend of development of devices and systems has followed the general trend of minimization which enables more functionality and more powerful calculation abilities, especially for medical applications. Recently, the other revolutionary development is the remote communication technology, which facilitate the advancement of the Internet of Things and Big Data, inspiring the wearable and implantable devices and systems. This session covers the updated research outcomes of devices and systems for medical applications, with highlights on novel functions and wearable/implantable features.

SS33.1 Piezoelectric nanogenerators using biomolecules, Ju Hyuck LEE, Daegu Gyeongbuk Institute of Science & Technology, Korea (invited)

SS33.2 Skin-integrated sensors and haptic interfaces for VR and AR, Xinge YU, City Univ. of Hong Kong, Hong Kong (invited)

SS33.3 Triboelectrification as an efficient tool for the development of self-powered sensors and systems, Zong-Hong LIN, National Tsing Hua Univ., Taiwan (invited)

SS33.4 Self-powered medical electronics, Zhou LI, Chinese Academy of Science, China (invited)

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YOUNG RESERACHER SESSIONS

Micro- and Nanotechnologies for Biological and Biomedical Applications

YR-1: 15:25 -16:40
Friday, November 22, 2019
Location: RM 212

Session Chair: Jungho AHN
Seoul National Univ., Korea

Description

Micro- and nanoscale environments including molecules, biophysical cues, and interactions between cell-cell, cell-extracellular matrix, and cell-substrates play important roles to engineer the complex and functional biological systems. This session will emphasize emerging micro- and nanotechnologies that can control functions of biological systems. These approaches will provide novel insights into developing new strategies for engineering functions of living systems for various applications such as microfluidics, organ-on-a-chip, tissue engineering, regenerative medicine, and drug screening and delivery for improving human life.

YR-1.1 Vascularized skin-on-a-chip: human skin constructs with perfusable vascular networks in vitro, Jihoon KO, Seoul National Univ., Korea (invited)

YR-1.2 High-throughput microfluidic 3D cytotoxicity assay for cancer immunotherapy, Yunchan HWANG, Seoul National Univ., Korea (invited)

YR-1.3 Directional migration of cancer cells under oxygen tension gradient, Hyeono NAM, KAIST, Korea (invited)

YR-1.4 cAMP/EPAC signaling enables ETV2 to induce endothelial cells with high angiogenesis potential, Da-Hyun KIM, Seoul National Univ., Korea (invited)

YR-1.5 3D microengineered vascularized tumor spheroid on a chip for drug delivery and efficacy testing, Jungho AHN, Seoul National Univ., Korea; Georgia Institute of Technology, USA (invited)

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Two- and Three-Dimensional Multifunctional Biomaterials for Micro- and Nanosystems

YR-2: 16:45 -18:00
Friday, November 22, 2019
Location: RM 213

Session Chair: Jungho AHN
Seoul National Univ., Korea

Description

Biomaterials are essential tools in the fields of tissue engineering and regenerative medicine, and its applications have gradually increased. Biomaterials with two and three-dimensional scale have become an attractive alternative for the investigation of cell biology, the development of smart devices, and the applications of tissue regeneration. This session will deal with the various approaches of achieving the applications of two and three-dimensional scale for development of new biomaterials with micro- and nanosystems, and it show promise in advancing the field including tissue engineering, regenerative medicine, drug delivery and biosensing for improving human life.

YR-2.1 Three dimensional mesenchymal stem cell printing and bone regeneration using graphene oxide/alginate composites, Goeun CHOE, Gwangju Institute of Science and Technology (GIST), Korea (invited)

YR-2.2 Micropatterned conductive hydrogels as multifunctional muscle-mimicking biomaterials: Graphene-incorporated hydrogels directly patterned with femtosecond laser ablation, Junggeon PARK, School of Materials Science and Engineering, Gwangju Institute of Science and Technology (GIST), Korea (invited)

YR-2.3 Nanoneedle hydrogels with precisely controlled sizes for intracellularly induced stem cell therapy, Sunho PARK, Chonnam National Univ., Korea (invited)

YR-2.4 Bionanoelectronic platform with a lipid bilayer/CVD-grown MoS_2 hybrid, Yunjeong PARK, Sungkyunkwan Univ., Korea (invited)

YR-2.5 Recapitulation of 3D cylindrical human blood-brain barrier in vitro using brain and blood vessel tissue specific bioinks and 3D bioprinting technology, Sooyeon LEE, Pohang Univ. of Science and Technology (POSTECH), Korea (invited)

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CONFERENCE BEST PAPER COMPETITIONS

SSB.1 Semi-empirical modeling for DNA bases via Z-shaped graphene nanoribbon with a nanopore devices, Asma WASFI; Falah AWWAD, United Arab Emirates Univ., United Arab Emirates (Paper - 2)

SSB.2 Fabrication and testing of a gold nanopartide-loaded tissue-mimicking phantom for validation of gold L-shell X-ray fluorescence imaging results, Sandun JAYARATHNA; Md Foiez AHMED; Sang Hyun CHO, Univ. of Texas MD Anderson Cancer Center, USA (Paper - 11)

SSB.3 Real-time and non-invasive measurement of 3D cancer cell invasion process under IL-6 cytokine stimulation, Chun-Hao HUANG; Kin Fong, Chang Gung Univ., Taiwan (Paper - 14)

SSB.4 Laser-induced Flexible Graphene Bioelectrodes for Enzymatic Biofuel Cell, Prakash REWATKAR; Avinash KOTHURU; Sanket GOEL, Birla Institute of Technology & Science, India (Paper - 20)

SSB.5 Timing the Therapeutic Trigger of Au Lipos Cur NPs for Effective Photothermal Therapy, Syed Baseeruddin ALVI; Shivangi PARADKAR; Arpan PRADHAN; Rohit SRIVASTAVA; Aravind Kumar RENGAN, Indian Institute of Technology at Hyderabad, India (Paper - 23)

SSB.6 Design and development of point of care test and optical reader for early screening of kidney related disorder, Pankaj SHIVHARE; Satyam MOHLA; Ashwini DANGE; Rohit SRIVASTAVA, City Univ. of Hong Kong, Hong Kong SAR (Paper - 29)

SSB.7 Additively manufactured nanofiber reinforced bioactive glass based functionally graded scaffolds for bone tissue engineering, K. Dixit; N. Sinha, Indian Institute of Technology at Kanpur, India (Paper - 31)

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IEEE-NANOMED POSTER SESSION

PS1: 12:40 -18:00
Saturday, November 23, 2019
Location: Conference Hall

PS1.1 Micro-system design of enhanced energizing module for targeted targets, Hengzhen FENG; Wenzhong LOU; Fuquan ZHENG; Zi YE; Yi SUN, Beijing Institute of Technology, China (Paper – 9)

PS1.2 Antimicrobial coating for medical devices using polyphenol/tannin surface chemistry hormone, Jihyo PARK; Seonki HONG, Daegu Gyeongbuk Institute of Science and Technology (DGIST), Korea (Paper – 13)

PS1.3 A novel non-enzymatic PEDOT:PSS/GO/MnO_2 based biosensor for hydrogen peroxide detection in biological samples, Vedashree V. SIRDESHMUKH; Shreshtha MISHRA; Indrayani KADU; Anup A. KALE (Paper – 19)

PS1.4 A minimally invasive flexible micro-needle array as continuous in vivo electrochemical glucose sensor, Qun MOU; Junshi LI; Fengyi ZHENG; Yue CUI; Yufeng JIN; and Zhihong LI, Peking University, China (Paper – 24)

PS1.5 Fabrication of magnetic microstructures for magnetic manipulation of cells, Fengshan SHEN; Y. YU; Y. CHEN, Chinese Academy of Sciences, China (Paper – 25)

PS1.6 Tannin-based nano-carrier for drug delivery with enhanced therapeutic efficacy, Jiyeon KIM; Seunghwi KIM; Seonki HONG, Daegu Gyeongbuk Institute of Science and Technology (DGIST), Korea (Paper – 27)

PS1.7 Biomolecular detection by SH-SAW biosensor with streptavidin-biotin, Xue-Chang LO; Da-Jeng YAO, National Tsing Hua University, Taiwan (Paper – 39)

PS1.8 Terahertz spectroscopy of alzheimer's amyloid fibrils, Gyuseok LEE; Euna JUNG; Han Eol LEE; Joonhyuck PARK; Sungjee KIM; Haewook HAN, Pohang University of Science and Technology, Korea (Paper – 40)

PS1.9 Study of human lymph nodes using terahertz imaging, Jonggeon LEE; Meehyun LIM; Euna JUNG; Hyuck Jae CHOI; Haewook HAN, Pohang University of Science and Technology, Korea; University of Ulsan Collage of Medicine, Korea (Paper – 41)

PS1.10 Programmed 'triple-mode' anti-tumor therapy: improving peritoneal retention, tumor penetration and activatable drug release properties for effective inhibition of peritoneal carcinomatosis, Veena VIJAYAN; Kondareddy CHERUKULA; In-Kyu PARK, Chonnam National University Hwasun Hospital, Korea (Paper – 42)

PS1.11 Bioactive polysaccharide-capped gold nanoparticles for CT imaging of lymph nodes, Mathew Ansuja PULICKAL; Saji UTHAMAN; Hyeon Sik KIM; Kang Moo HUH; In-Kyu PARK, Chonnam National University Medical School, Korea; Chungnam National University, Korea (Paper – 43)

PS1.12 The fabrication and characterization of decellularized-ECM-nanofibers for regenerating skeletal muscle, H. LEE; W. J. KIM; G. H. YANG; J. Y. LEE; M. YEO; Y. W. KOO; J. U. LEE; H. R. KIM; Y. E. CHOE; S. J. CHAE; J. HONG; J. Y. KIM; S. J. LEE; G. H. KIM, Wake Forest School of Medicine, USA; Sungkyunkwan University (SKKU), Korea (Paper – 44)

PS1.13 Fabrication of 3D PCL/cellulose spring shaped hybrid scaffold via electrohydrodynamic process for bone tissue regeneration, Y. E. CHOE; G.-H. YANG; M. YEO; J. Y. LEE; Y. W. KOO; W. J. KIM; J. U. LEE; H. KIM; S. J. CHAE; J. Y. HONG; J. Y. KIM; G. H. KIM, Sungkyunkwan University (SKKU), Korea (Paper – 45)

PS1.14 Magnetic field-Inducible drug-eluting nanoparticles for image-guided thermo-chemotherapy, Shameer PILLARISETTI; Kondareddy CHERUKULA; In-Kyu PARK, Chonnam National University Medical School, Korea (Paper – 46)

PS1.15 IR-780 dye loaded zwitterionic micellar nanoparticle for NIR imaging and photothermal therapy in a cervical tumor model, Adityanarayan MOHAPATRA; Santhosh Kalash RAJENDRAKUMAR; In-Kyu PARK, Chonnam National University Medical School, Korea (Paper – 47)

PS1.16 NIR dye loaded micelles for CD-44 based targeted photo-thermal therapy, Saji UTHAMAN; Kang Moo HUH; In-Kyu PARK, Chungnam National University, Korea; Chonnam National University Medical School, Korea (Paper – 48)

PS1.17 Bone-mimicked 3D scaffolds using collagen and nano-porous HA particles for hard tissue regeneration, Young Won KOO; Ji Un LEE; Jiyoung HONG; Won Jin KIM; Young Eun CHOE; Gihoon YANG; Geun Hyung KIM, Sungkyunkwan University, Korea (Paper – 49)

PS1.18 Hybrid composites of cellulose nanocrystal and polycaprolactone as scaffold materials for cardiomyocyte regeneration, Joseph BATTA-MPOUMA; Cody CHIVERS; Garett HUFFSTUTLER; Hanna K. JENSEN; Morten O. JENSEN; Jangho KIM; Jin-Woo KIM, University of Arkansas, Fayetteville, USA; Chonnam National University, Korea (Paper – 50)

PS1.19 The effect of external substances and magnetic attraction property on internalization of nanoparticles to cochlear explant, Jeong-Eun PARK; Sung Kyun KIM; Wan Su YUN; Dong Jun PARK; Su Hoon LEE; Jaehong KEY; Young Joon SEO, Yonsei University Wonju College of Medicine, Korea; Hallym University College of Medicine, Dongtan Sacred Heart Hospital, Korea; Yonsei University, Korea (Paper – 51)

PS1.20 A novel nanoparticle for oral insulin formulation using the alginate-glycol chitosan conjugated with lactoferrin, Sun Joo KIM; Dong Yun LEE, Hanyang University, Korea (Paper – 52)

PS1.21 Magnetic targeting of stem cell spheroids into specific lobe of liver using nanohybrid system, Sang Joon LEE; Dong Yun LEE, Hanyang University, Korea (Paper – 53)

PS1.22 Fabrication of 3D nano-hydroxyapatite/gelating/glycerol scaffold using dual 3D printing system for bone tissue regeneration, D. Y. KIM; Y. E. CHOE; M. J. YEO; J. Y. LEE; W. J. KIM; J. LEE; H. KIM; S. J. CHAE; J. Y. HONG; J. Y. KIM; G. H. KIM, Sungkyunkwan University (SKKU), Korea; Korea Polytechnic University, Korea (Paper – 54)

PS1.23 Solvent post-treatment of electrospun poly(ε-caprolactone) with highly concentrated calcinated hydroxyapatite, Jae Woon LIM; Kyoung-Je CHANG; Myungchul LEE; Sangbae PARK; Jong Hoon CHUNG, Seoul National University, Korea (Paper – 57)

IEEE-NANOMED 2019

21 - 24 November 2019
Gwangju, Korea

The 13th IEEE International Conference on Nano/Molecular Medicine & Engineering

Who should attend:

IEEE-NANOMED is one of the premier annual events organized by the IEEE Nanotechnology Council (NTC) to bring together physicians, scientists and engineers alike from all over the world and every sector of academy and industry, working at advancement of basic and clinical research in medical and biological sciences using nano/molecular and engineering methods. IEEE-NANOMED is the conference where practitioners will see nano/molecular medicine and engineering at work in both their own and related fields, from essential and advanced scientific and engineering research and theory to translational and clinical research.

Suggested topics include:

- Nano and molecular technologies in medical theranostics
- Nanotechnology in drug delivery
- Biomedical imaging
- Bio/nano sensing
- Biochips and Bio-MEMS
- Biomechatronics
- Biological interface
- Cells at the nanoscale
- Frontiers in nanobiotechnology
- Translational medicine

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- Organizing Chairs:
  Jangho Kim, Chonnam National Univ., Korea | Hyun Ho Lee, Myongji Univ., Korea

Paper Publications:

Papers presented at IEEE-NANOMED 2019 will be selected to publish in special issues of peer-reviewed NTC sponsored journals:

- IEEE Transactions on Nanotechnology (IF 2.857) (Letter section)
  (http://ieeexplore.ieee.org/xpl/Recentissue.jsp?punumber=7729)
- IEEE Transactions on NanoBioscience (IF 2.158)
  (http://ieeexplore.ieee.org/xpl/Recentissue.jsp?punumber=7728)
- IEEE Nanotechnology Magazine
  (Indexed in Web of Science™ Emerging Sources Citation Index [ESCI])
  (http://ieeexplore.ieee.org/xpl/Recentissue.jsp?punumber=4451717)
- Accepted full papers for IEEE-NANOMED will be submitted for inclusion into IEEE Xplore as well as other Abstracting & Indexing (A&I) databases.

Important Dates:

Two-Page Abstract Deadline (both Oral & Poster):
August 15, 2019 *

* Best paper competition:
A full paper (4 to 6 pages) is required by August 15, 2019 to enter best paper contests.

Notification of Acceptance: September 10, 2019

Full-Paper Submission Deadline: October 20, 2019
(Only required to publish papers in Xplore)

Early Bird Registration: September 30, 2019

Contact Information

Should you have any questions, email to: ieeenanomed2019@gmail.com
Visit the IEEE-NANOMED 2019 website at http://ieee-nanomed.org/2019/ for additional information