The 15th IEEE International Conference on
Nano/Micro Engineered & Molecular Systems

Virtual IEEE-NEMS

2020

TECHNICAL PROGRAM

IEEE

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September 27-30, 2020

Virtual IEEE-NEMS 2020 Technical Program

September 2020

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VIRTUAL IEEE-NEMS 2020

The 15th IEEE International Conference on Nano/Micro Engineered & Molecular Systems
September 27 - 30, 2020

IEEE

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

WELCOME

we are delighted to welcome you to the 15th International Conference on Nano/Micro Engineered & Molecular Systems (IEEE-NEMS 2020) in September 27 – 30, 2020. In light of the present circumstances related to the COVID-19 pandemic, IEEE-NEMS 2020 is offered in an all-virtual format. Originally launched in 2006, IEEE-NEMS has grown to be a premier conference series sponsored by the IEEE Nanotechnology Council and has brought together world-class engineers and scientists from all over the world and every sector of academy and industry, enabling the exchange of the latest advances in basic and applied research in the field of M/NEMS, nanotechnology and molecular technology. Prior IEEE-NEMS conferences were held in China (Zhuhai, 2006), Thailand (Bangkok, 2007), China (Hainan Island, 2008), China (Shenzen, 2009), China (Xiamen, 2010), Taiwan (Kaohsiung, 2011), Japan (Kyoto, 2012), China (Suzhou, 2013), USA (Hawaii, 2014), China (Xi'an, 2015), Japan (Sendai, 2016), USA (Los Angeles, 2017), Singapore (2018) and Macau (2019).

This is our first all-virtual IEEE-NEMS conference! Following the cancellation of the onsite conference in San Diego, California, USA due to the COVID-19, we shifted to a virtual meeting space with the goal of providing engaging, rewarding and meaningful experience for the NEMS community. Although the transition to a virtual format was somewhat bumpy and had some glitches, Virtual IEEE-NEMS 2020 is destined to be a one-of-a-kind event, thanks to your patience, understanding and willingness to support us during the transition! Special gratitude and appreciation are also extended to the conference organizing committees, many other volunteers and our stellar professional staff for their enormous work behind the scenes to ensure the delivery and success of this very important conference. Thanks to the outstanding work of Technical Program Committee, we have such an excellent and challenging technical program, which broadly reaches the field of M/NEMS, nanotechnology and molecular technology, and provides a highly innovative and informative venue for essential and advanced scientific and engineering research. Fifteen state-of-the-art plenary and keynote presentations by leading experts, 25 technical sessions with over +60 invited and +90 technical presentations, and four poster sessions with +50 poster presentations during our 4-day virtual event ensure an interactive and inspiring exchange between participants, making Virtual IEEE-NEMS 2020 the right place for new bridges in science, engineering and knowledge. We wish you a superb conference experience and our best for your health and safety in these challenging times!


Welcome to Virtual IEEE-NEMS 2020!

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John T.-W. YEOW, Program Chair
University of Waterloo, Waterloo, ON, Canada

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Virtual IEEE-NEMS 2020

IEEE-NEMS Virtual Sessions are all in EST (UTC-04:00).

September 27 [Sunday]

Time (EST)	RM 001		
08:30-08:50	**Opening Ceremony**		
08:50-09:35	**Plenary Lecture 1**: Joseph WANG, Univ. of California at San Diego, USA (Chair: Jin-Woo KIM) *"Wearable Electrochemical Sensors: Toward Chemical Lab on the Body"*		
09:35-10:20	**Plenary Lecture 2**: Chang-Jin "CJ" KIM, Univ. of California at Los Angeles, USA (Chair: Da-Jeng YAO) *"Democratizing EWOD Digital Microfluidics by Cybermanufacturing"*		
10:20-10:30	*Break*		
10:30-11:05	**Keynote Lecture 1**: Mark HERSAM, Northwestern Univ., USA (Chair: Jin-Woo KIM) *"Mixed-dimensional Heterostructures for Electronic and Energy Applications"*		
11:05-11:40	**Keynote Lecture 2**: Inkyu PARK, Korea Advanced Inst. of Science & Technology, Korea (Chair: Wen J. LI) *"Compact, Low-power/Self-powered Gas Sensors Enabled by MEMS Platform & Functional Nanostructures"*		
11:40-12:10	*Lunch/Break* & **Poster Session 1** Paper ID: 23, 44, 70, 1004, 1028, 1079, 1080, 1115, 1116		
12:10-13:50	RM 001	RM 002	RM 003
	Invited Session 1	**Invited Session 2**	**Invited Session 3**
	Wearable Multifunctional Micro/Nanosystems Chair: Wei GAO	Microbiosensors Chair: Gwo-Bin LEE	Nanomaterials & Nano-Micro-Devices for Biosensing + Paper ID: 4, 84 Chair: Jun LI
13:50-14:00	*Break*		
14:00-15:30	RM 001	RM 002	RM 003
	Technical Session 1	**Technical Session 2**	**Technical Session 3**
	MEMS/NEMS I Chair: Mahmoud ALMASRI Paper ID: 38, 39, 90, 96, 993, 1025, 1120	Sensors & Actuators I Chair: Aaeemuddin SYED Paper ID: 31, 1014, 1045, 1052, 1096, 1110	Sensors & Actuators II Chair: Aaron OHTA Paper ID: 12, 27, 32, 63, 83, 88, 1048

September 28 [Monday]

Time (EST)	RM 001			
08:30-09:15	**Plenary Lecture 3**: Kit PARKER, Harvard Univ., USA (Chair: Jin-Woo KIM) *"Designing a Shape-Memory Material Using Keratin Extracted from Animal Hair for Smart Textiles"*			
09:15-10:00	**Plenary Lecture 4**: Thomas J. WEBSTER, Northeastern Univ., USA (Chair: John YEOW) *"Goodbye Hospitals and Hello Implantable Nano Sensors"*			
10:00-10:10	*Break*			
10:10-10:45	**Keynote Lecture 3**: Ryuji YOKOKAWA, Kyoto Univ., Japan (Chair: Gwo-Bin LEE) *"On-chip Vasculature for Three-dimensional Tissue Culture and Microphysiological Systems"*			
10:45-11:20	**Keynote Lecture 4**: Kremena MAKASHEVA, LAPLACE, Université de Toulouse, France (Chair: Gwo-Bin LEE) *"AgNPs Embedded in Silica Matrix: A Way to Impair the Microbial Adhesion on Dielectric Surfaces"*			
11:20-11:30	*Break*			
11:30-13:10	RM 001	RM 002	RM 003	RM 004
	Invited Session 4	**Invited Session 5**	**Invited Session 6**	**ISC Meeting**
	Active Biomaterials for Diagnosis & Therapies Chairs: Hyunjoon KONG Sung Gap LIM	Impedance Based Biosensors Chair: Mahmoud ALMASRI	Emerging Materials & Flexible Electronics Chair: Yunlong ZI	
13:10-13:40	*Lunch/Break* & **Poster Session 2** Paper ID: 33, 45, 56, 1000, 1041, 1068, 1090, 1100, 1126			
13:40-15:10	RM 001	RM 002	RM 003	RM 004
	Technical Session 4	**Technical Session 5**	**Technical Session 6**	**Technical Session 7**
	MEMS/NEMS II Chair: Mahmoud ALMASRI Paper ID: 79, 1084, 1086, 1092, 1095,1102, 1125	Micro/Nano Fabrication Chair: Sheng XU Paper ID: 16, 52, 92, 1035, 1029, 1118	Micro/Nano Fluidics I Chair: Aaron OHTA Paper ID: 21, 22, 46, 97, 98, 996	Sensing Materials & Energy Devices I Chair: Jun LI Paper ID: 14, 17, 55, 1006, 1010, 1032, 1049
15:10-15:40	**Poster Session 3** Paper ID: 40, 1009, 1034, 1036, 1044, 1046, 1099, 1123,1124			

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September 29 [Tuesday]

Time (EST)	RM 001		
08:30-09:15	**Plenary Lecture 5**: Ajay K. SOOD, Indian Institute of Science, Banglore, India (Chair: John YEOW) *"Terahertz Ultrafast Photoconductivity of 2D Materials"*		
09:15-09:50	**Keynote Lecture 5**: Xin ZHANG, Boston Univ., USA (Chair: John YEOW) *"Metamaterial Devices: Integrating Microsystems with Metamaterials"*		
09:50-10:00	*Break*		
10:00-10:35	**Keynote Lecture 6**: Bing-Joe HWANG, Nat'l Taiwan Univ. of Science & Technology, Taiwan (Chair: Da-Jeng YAO) *"Nanocatalysts for Electrochemical Energy Conversion Reactions"*		
10:35-11:10	**Keynote Lecture 7**: Qing CAO, Univ. of Illinois at Urbana-Champaign, USA (Chair: Jin-Woo KIM) *"Replacing Silicon with Carbon Nanotubes in Logic Transistors"*		
11:10-11:20	*Break*		
11:20-13:00	RM 001 **Invited Session 7** Advances in 2D Materials & Their Applications Chair: Dong LIN	RM 002 **Invited Session 8** Micro/Nano Engineering for Advanced Bio/Medical Systems Chair: Yoshikazu HIRAI	RM 003 **Invited Session 9** Micro-Nano Engineering & Smart Electronics Chair: Xiaosheng ZHANG
13:00-13:30	*Lunch/Break* & **Poster Session 4** Paper ID: 94, 1011, 1018, 1020, 1042,1103, 1108, 1111		
13:30-15:00	RM 001 **Technical Session 8** Nanobiology/Nanomedicine I Chair: Nalinikanth KOTAGIRI Paper ID: 19, 47, 50, 66, 77, 1091	RM 002 **Technical Session 9** Nanobiology/Nanomedicine II Chair: Joshua SAKON Paper ID: 7, 9, 57, 73, 997, 1093, 1114	RM 003 **Technical Session 10** Micro/Nano Fluidics II Chair: Aaron OHTA Paper ID: 36, 1008, 1033, 1037, 1039, 1119

September 30 [Wednesday]

Time (EST)	RM 001		
08:30-09:15	**Plenary Lecture 6**: Oleg GANG, Columbia Univ., USA (Chair: Jin-Woo KIM) *"Programmable Assembly of 3D Nanomaterials"*		
09:15-09:50	**Keynote Lecture 8**: Do-Nyun KIM, Seoul Nat'l Univ., Korea (Chair: John YEOW) *"Mechanical Design Strategies for DNA Origami Nanostructures"*		
09:50-10:25	**Keynote Lecture 9**: Dan NICOLAU, McGill Univ., Canada (Chair: Jin-Woo KIM) *"Biocomputation with Nano/Micro Biological Agents Exploring Physical Networks"*		
10:25-11:25	**Closing Remarks/Awards/Announcement IEEE-NEMS 2021**		
11:25-11:35	*Break*		
11:35-13:15	RM 001 **Invited Session 10** Single-Cell Analysis Chair: Tuhin SANTRA	RM 002 **Invited Session 11** Smart Sensors for Healthcare Applications Chair: Zong-Hong LIN	RM 003 **Invited Session 12** Energy Harvesting & Smart Systems + Paper ID 1051 Chair: Yunlong ZI
13:15-13:25	*Break*		
13:25-15:20	RM 001 **Technical Session 11** Sensing Materials & Energy Devices II Chair: Sheng XU Paper ID: 10, 59, 992, 1007; 1012, 1097	RM 002 **Technical Session 12** Nanomaterials/Nanomechanics I Chair: Nalinikanth KOTAGIRI Paper ID: 8, 51, 60, 995, 1017, 1112, 1031	RM 003 **Technical Session 13** Nanomaterials/Nanomechanics II Chair: Aaron OHTA Paper ID: 15, 25, 54, 61, 62, 76, 1121

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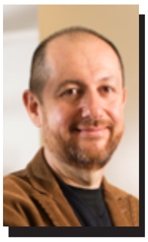
Plenary



Oleg GANG

Columbia Univ. & Brook Haven Nat'l Lab, USA

"Programmable Assembly of 3D Nanomaterials

Chang-Jin "CJ" KIM

Univ. of California, Los Angeles, USA

"Democratizing EWOD Digital Microfluidics by Cybermanufaturing"

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"Goodby Hospitals & Hello Implantable Nano Senors"

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KEYNOTE HIGHLIGHTS

Keynote

Qing CAO

Univ. of Illinois at Urbana-Champaign, USA

"Replacing Silicon with Carbon Nanotubes in Logic Transistors"

Do-Nyun KIM

Seoul Nat'l Univ., Korea

"Mechanical Design Strategies for DNA Origami Nanostructures"

Inkyu PARK

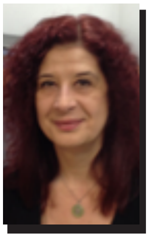
Korea Advanced Inst. of Science & Technology, Korea

"Compact, Low-power/Self-powered Gas Sensors Enabled by MEMS Platform & Functional Nanostructures"

Mark HERSAM

Northwestern Univ., USA

"Mixed-dimensional Heterostructures for Electronic & Energy Applications"



Kremena MAKASHEVA

LAPLACE, Université De Toulouse, France

"AgNPs Embedded in Silica Matrix: A way to Impair the Microbial Adhesion on Dielectric Surfaces"

Ryuji YOKOKAWA

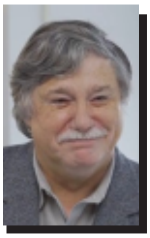
Kyoto Univ., Japan

"On-chip Vasculature for Three-dimensional Tissue Culture & Micro-physiological Systems"

Bing Joe HWANG

Nat'l Taiwan Univ. of Science & Technology, Taiwan

"Nanocatalysts for Electrochemical Energy Conversion Reactions"



Dan V. NICOLAU

McGill Univ., Canada

"Biocomputation with Nano/Micro Biological Agents Exploring Physical Networks"

Xin ZHANG

Northeastern Univ., USA

"Metamaterial Devices: Integrating Microsystems with Metamaterials"

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Invited Sessions

IS1 Wearable Multifunctional Micro/Nano Systems
Session Chair: Wei GAO, California Inst. of Technology, USA
Time: 12:10-13:50 (EST), Sept. 27, 2020 (Room 001)

IS2 Microbiosensors
Session Chair: Gwo-Bin LEE, Nat'l Tsing Hua Univ., Taiwan
Time: 12:10-13:50 (EST), Sept. 27, 2020 (Room 002)

IS3 Nanomaterials & Nano-/Micro-Devices for Biosensing
Session Chair: Jun LI, Kansas State Univ., USA
Time: 12:10-13:50 (EST), Sept. 27, 2020 (Room 003)

IS4 Active Biomaterials for Diagnosis & Therapies
Session Chair: Hyunjoon KONG, Univ. of Illinois at Urbana-Champaign, USA; Sung Gap IM, Korea Advanced Inst. of Science & Technology, Korea
Time: 11:30-13:10 (EST), Sept. 28, 2020 (Room 001)

IS5 Impedance Based Biosensors
Session Chair: Mahmoud ALMASRI, Univ. of Missouri, USA
Time: 11:30-13:10 (EST), Sept. 28, 2020 (Room 002)

IS6 Emerging Materials & Flexible Electronics
Session Chair: Yunlong ZI, Chinese Univ. of Hong Kong, China
Time: 11:30-13:10 (EST), Sept. 28, 2020 (Room 003)

IS7 Advances in 2D Materials and Their Applications
Session Chair: Don LIN, Kansas State Univ., USA
Time: 11:20-13:00 (EST), Sept. 29, 2020 (Room 001)

IS8 Micro/Nano Engineering for Advanced Bio/Medical Systems
Session Chair: Yoshikazu HIRAI, Kyoto Univ., Japan
Time: 11:20-13:00 (EST), Sept. 29, 2020 (Room 002)

IS9 Micro-Nano Engineering & Smart Electronics
Session Chair: Xiaosheng ZHANG, Univ. of Electronic Science & Technology of China, China
Time: 11:20-13:00 (EST), Sept. 29, 2020 (Room 003)

IS10 Single-Cell Analysis
Session Chair: Tuhin Subhra SANTRA, Indian Inst. of Technology at Madras, India
Time: 11:35-13:15 (EST), Sept. 30, 2020 (Room 001)

IS11 Smart Sensors for Healthcare Applications
Session Chair: Zong-Hong LIN, Nat'l Tsing Hua Univ., Taiwan
Time: 11:35-13:15 (EST), Sept. 30, 2020 (Room 002)

IS12 Energy Harvesting & Smart Systems
Session Chair: Yunlong ZI, Chinese Univ. of Hong Kong, China
Time: 11:35-13:15 (EST), Sept. 30, 2020 (Room 003)

Technical Sessions

TS1 MEMS/NEMS I
Session Chair: Mahmoud ALMASRI, Univ. of Missouri, USA
Time: 14:00-15:45 (EST), Sept. 27, 2020 (Room 001)

TS2 Sensors & Actuators I
Session Chair: Aaeemuddin SYED, Int'l Inst. of Information Technology, India
Time: 14:00-15:45 (EST), Sept. 27, 2020 (Room 002)

TS3 Sensors & Actuators II
Session Chair: Aaron OHTA, Univ. of Hawaii, USA
Time: 14:00-15:45 (EST), Sept. 27, 2020 (Room 003)

TS4 MEMS/NEMS II
Session Chair: Mahmoud ALMASRI, Univ. of Missouri, USA
Time: 13:40-15:25 (EST), Sept. 28, 2020 (Room 001)

TS5 Micro/Nano Fabrication
Session Chair: Sheng XU, Univ. of California at San Diego, USA
Time: 13:40-15:25 (EST), Sept. 28, 2020 (Room 002)

TS6 Micro/Nano Fluidics I
Session Chair: Aaron OHTA, Univ. of Hawaii, USA
Time: 13:40-15:25 (EST), Sept. 28, 2020 (Room 003)

TS7 Sensing Materials & Energy Devices I
Session Chair: Jun LI, Kansas State Univ., USA
Time: 13:40-15:25 (EST), Sept. 28, 2020 (Room 004)

TS8 Nanobiology/Nanomedicine I
Session Chair: Nalinikanth KOTAGIRI, Univ. of Cincinnati, USA
Time: 13:30-15:15 (EST), Sept. 29, 2020 (Room 001)

TS9 Nanobiology/Nanomedicine II
Session Chair: Joshua SAKON, Univ. of Arkansas, USA
Time: 13:30-15:15 (EST), Sept. 29, 2020 (Room 002)

TS10 Micro/Nano Fluidics II
Session Chair: Aaron OHTA, Univ. of Hawaii, USA
Time: 13:30-15:15 (EST), Sept. 29, 2020 (Room 003)

TS11 Sensing Materials & Energy Devices II
Session Chair: Sheng XU, Univ. of California at San Diego, USA
Time: 13:25-15:20 (EST), Sept. 29, 2020 (Room 001)

TS12 Nanomaterials/Nanomechanics I
Session Chair: Nalinikanth KOTAGIRI, Univ. of Cincinnati, USA
Time: 13:25-15:20 (EST), Sept. 29, 2020 (Room 002)

TS13 Nanomaterials/Nanomechanics II
Session Chair: Aaron OHTA, Univ. of Hawaii, USA
Time: 13:25-15:20 (EST), Sept. 29, 2020 (Room 003)

Wearable Electrochemical Sensors: Toward Chemical Lab on the Body

PL1: 08:50 – 09:35
Sunday, September 27, 2020
Location: RM 001

JOSEPH WANG

University of California, San Diego, USA
josephwang@ucsd.edu

ABSTRACT

Wearable sensors have received a major recent attention owing to their considerable promise for monitoring the wearer's health and wellness [1,2]. The medical interest for wearable systems arises from the need for monitoring patients over long periods of time. These devices have the potential to continuously collect vital health information from a person's body and provide this information to them or their healthcare provider in a timely fashion. Such sensing platforms provide new avenues to continuously and non-invasively monitor individuals and can thus tender crucial real-time information regarding a wearer's health. This presentation will discuss recent developments in the field of wearable electrochemical sensors integrated directly on the epidermis, under the skin, or within the mouth for various non-invasive and minimally-invasive biomedical monitoring applications [3]. Particular attention will be given to non-invasive monitoring of metabolites and electrolytes using flexible electrochemical sensors, to multiplexed microneedle sensor arrays, along with related materials, energy and integration considerations. The preparation and characterization of such wearable electrochemical sensors will be described, along with their current status and future prospects and challenges.

[1] "Wearable Chemical Sensors: Present Challenges and Future Prospects" A. J. Bandodkar, I. Jeerapan, J. Wang, ACS Sensors, 2016, 1, 464.

[2] A. J. Bandodkar and J. Wang, "Non-invasive wearable electrochemical sensors: a review", Trends Biotechnol., 2014, 32, 363.

[3] "Wearable biosensors for healthcare monitoring", J. Kim, A. S. Campbell, B. Esteban-Fernández de Ávila, and J. Wang, Nature Biotechnology, 2019, 37, 389.

SHORT BIO

Joseph Wang is Distinguished Professor, SAIC Endowed Chair, and former Chair of the Department of Nanoengineering at University of California, San Diego (UCSD). He is also the Director of the UCSD Center of Wearable Sensors. He served as the director of Center for Bioelectronics and Biosensors of Arizona State University (ASU) before joining UCSD. Prof. Wang has published more than 1100 papers, 11 books and he holds 25 patents (H Index=175, >120,000 citations). He received 2 American Chemical Society National Awards in 1999 (Instrumentation) and 2006 (Electrochemistry), ECS Sensor Achievement Award (2018) and 5 Honorary Professors from Spain, Argentina, Czech Republic, Romania, China and Slovenia. Prof. Wang has been the Founding Editor of Electroanalysis (Wiley) and is RSC and AIMBE Fellow. His scientific interests are concentrated in the areas of bioelectronics, wearable devices, biosensors, bionanotechnology, and nanomachines.

Democratizing EWOD Digital Microfluidics by Cybermanufacturing

PL2: 09:35 – 10:20
Sunday, September 27, 2020
Location: RM 001

Chang-Jin "CJ" Kim

Univ. of California, Los Angeles, USA
cjkim@ucla.edu

Abstract

As a surface configuration that made electrowetting practical for engineering, electrowetting-on-dielectric (EWOD) is an elegantly simple liquid handling method that has witnessed explosive advancements in research and persistent commercialization activities since around Year 2000. By allowing users to handle liquid droplets with only electric signals on a chip, EWOD gave birth to digital microfluidics, which led to many applications including the commercial products of today. Despite the success, EWOD is known to suffer from unique reliability problems originated from its reliance on the dielectric layer and hydrophobic topcoat, which narrow the path to commercial applications. Furthermore, many researchers who decide to utilize EWOD because of its apparent simplicity find themselves consumed by developing devices rather than utilizing them for their real purpose. To help addressing the problems associated with hydrophobic topcoat, even an opposite mechanism named electrodewetting has recently been developed to provide another option for realizing digital microfluidics. Based on either electrowetting or electrodewetting, the community of digital microfluidics is still rather small, especially considering its true potential. To eliminate the bottlenecks that have been preventing far more researchers from joining and staying in the field, we are cultivating a cybermanufacturing ecosystem, where a wide range of users (e.g., researchers, entrepreneurs, students, hobbyists) can focus on their own ideas and applications without worrying about the engineering and manufacturing hurdles of electrowetting and electrodewetting technology.

Short Bio

Professor CJ Kim received his B.S. from Seoul National University, M.S. from Iowa State University, and Ph.D. from the University of California at Berkeley, all in mechanical engineering, and joined the faculty at UCLA in 1993. Holding the Distinguished Professor title and the Volgenau Endowed Chair, he directs the Micro and Nano Manufacturing Lab to perform research in MEMS and Nanotechnology, including design and fabrication of micro/nano structures, actuators and systems, with a focus on the use of surface tension. The recipient of the Research Excellence Award (Iowa State Univ.), TRW Outstanding Young Teacher Award (UCLA), NSF CAREER Award, ALA Achievement Award, Samueli Outstanding Teacher Award (UCLA), and Ho-Am Prize in Engineering, Prof. Kim has served on numerous professional and governmental activities, including General Chair of the 2014 IEEE International Conference on MEMS. An ASME Fellow and AIMBE Fellow, he is currently serving as Senior Editor of the IEEE Journal of MEMS; on the Editorial Advisory Board for IEEJ Transactions on Electrical and Electronic Engineering; and on the Editorial Board for Micro and Nano Systems Letters. He has also been active as a scientific advisor, consultant, and founder of start-up companies.

Designing a Shape-memory Material Using Keratin Extracted from Animal Hair for Smart Textiles

PL3: 08:30 – 09:15
Monday, September 28, 2020
Location: RM 001

Kit Parker

Harvard Univ., USA
kkparker@g.harvard.edu

Abstract

We have spent the last decade developing methods to produce high functioning nanofibers from biological polymers. In this presentation, I will present our efforts to develop a hierarchical structured keratin-based system that has long-range molecular order and shape-memory properties in response to hydration. We report the metastable reconfiguration of the keratin secondary structure, the transition from α-helix to β-sheet, as an actuation mechanism to design a high-strength shape-memory material that is biocompatible and processable through fiber spinning and three-dimensional (3D) printing. We extracted keratin protofibrils from animal hair and subjected them to shear stress to induce their self-organization into a nematic phase, which recapitulates the native hierarchical organization of the protein. This self-assembly process can be adapted to produce materials with desired anisotropic structuring and responsiveness. Our combination of bottom-up assembly and top-down manufacturing allows for the scalable fabrication of strong and hierarchically structured shape-memory fibers and 3D-printed scaffolds with potential applications in bioengineering and smart textiles.

Short Bio

Parker is the Tarr Family Professor of Bioengineering and Applied Physics in the Paulson School of Engineering and Applied Sciences at Harvard University. He is a primary faculty member of the Harvard Stem Cell Institute. He received his B.S. from Boston University in Biomedical Engineering and his M.S. in Mechanical Engineering and Ph.D. in Applied Physics from Vanderbilt University. He was a postdoctoral fellow in Pathology at Children's Hospital in Boston and in Biomedical Engineering at the Johns Hopkins School of Medicine. Parker is the director of the SEAS Disease Biophysics Group whose research focuses on organ development and the functional implications of biological form, and how the coupling between form and function goes awry during disease. Parker is a Colonel in the United States Army Reserve with a joint faculty appointment at the United States Military Academy at West Point. In addition to these activities, Parker has founded several companies and serves as a consultant to the medical device and pharmaceutical industries.

Goodbye Hospitals & Hello Implantable Nano Sensors

PL4: 09:15 – 10:00
Monday, September 28, 2020
Location: RM 001

Thomas J. Webster

Northeastern Univ., USA
th.webster@neu.edu

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: 92) 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.

Terahertz Ultrafast Photoconductivity of 2D Materials

PL5: 08:30 – 19:15
Tuesday, September 29, 2020
Location: RM 001

Ajay K. Sood

Indian Inst. of Science
Bangalore, India
asood@iisc.ac.in

Abstract

In recent years, ultrafast time-resolved Raman spectroscopies have proved to be excellent probes to understand photo physics of quantum materials- be it in bulk or in nano-dimensions. Ultrafast lasers offer unique possibilities to control and probe transient processes in nano materials. Following photoexcitation by a femtosecond laser pulse, the carrier dynamics includes many important processes like thermalization, energy relaxation, exciton formation and spin dynamics which are impacted by dimensionality. Their understanding is crucial not only for many optoelectronic applications, but also to gain a deeper understanding of physical processes in nano systems. My talk will discuss our work on photoconductivity of graphene and carbon nanotubes using optical pump-terahertz probe spectroscopy. A quantitative understanding of dynamic conductivity based on generalized Boltzmann transport model gives us insights into various relaxation mechanisms [1-3]. I will also discuss our recent work on Dirac surface Plasmons in nanowires of topological insulators [4].

[1] S. Kar, Van L. Nguyen, D.R. Mohapatra, Y.H. Lee & A.K. Sood. Ultrafast spectral-response of bilayer graphene: Optical pump-terahertz probe spectroscopy and theory. ACS Nano 12, 1785 (2018) and Unpublished results (2020)
[2] S. Kar, D.R. Mohapatra and A.K. Sood. Tunable terahertz photoconductivity of hydrogen functionalized graphene using optical pump-terahertz probe spectroscopy, Nanoscale 10, 14321 (2018)
[3] S. Kar and A.K. Sood. Ultrafast terahertz photo response of single and double-walled carbon nanotubes: Optical pump-terahertz probe spectroscopy. Carbon 144, 731 (2019)
[4] K.P. Mithun, S. Kar, A. Kumar, N. Ravishankar and A.K. Sood (2020)

Short Bio

Prof. A.K. Sood, FRS is Year of Science Chair Professor in Department of Physics at Indian Institute of Science, Bangalore. He was the President of the Indian National Science Academy (2017-2019), President of the Indian Academy of Sciences (2010-2012) and the Secretary General of The World Academy of Sciences (TWAS) (2013-2018). Currently, he is a member of the Science, Technology and Innovation Advisory Council of the Prime Minister of India. Prof. Sood's research interests include Physics of Nano systems such as graphene and other 2D materials and soft condensed matter, with a strong focus on innovative experiments. The experimental probes used for exploring physics at nanoscale are Raman spectroscopy, Ultrafast time resolved spectroscopies including terahertz spectroscopy, transport measurements and x-ray diffractions He has published more than 420 papers in international journals and holds a few national and International patents. His work has been recognized by way of many honors and awards .These include the Fellowship of the Royal Society (FRS), all the three science academies of India and TWAS; the civilian honor, Padma Shri by Government of India, S.S. Bhatnagar Prize, G.D. Birla Award, TWAS Prize in Physics, FICCI Prize, Goyal Prize, M.N. Saha Award and Millennium Gold Medal of Indian Science Congress, Sir C.V. Raman Award of UGC, Homi Bhabha Medal of Indian National Science Academy, DAE Raja Ramanna Award of JNCASR, National Award in Nanoscience and Nanotechnology by Government of India, Nano Award by Government of Karnataka, G.M. Modi Award of Science and R D Birla Award for Excellence in Physics by Indian Physics Association. He is Associate Editor of ACS Nano and Executive Editor of Solid State Communications.

Programmable Assembly of 3D Nanomaterials

PL6: 08:30 – 09:15
Wednesday, September 30, 2020
Location: RM 001

Oleg Gang

Columbia Univ., USA
Brookhaven Nat'l Laboratory, USA
og2226@columbia.edu

Abstract

The ability to organize nano-components into the desired architectures with targeted properties can enable a broad range of nanotechnological applications, from designed biomaterial to optical systems and information processing. However, we are currently lacking an adaptable and broadly applicable methodology for the bottom-up 3D nanofabrication of the prescribed nanoscale structures. I will discuss our efforts in establishing a versatile platform for the formation of targeted 3D architectures from inorganic and biomolecular nano-components based on the molecularly programmable assembly. The recent advances on building periodic and hierarchical organizations from inorganic nanoparticles, proteins and enzymes using DNA-based methods will be presented. I will demonstrate how these assembly approaches can be used for a fabrication of nanomaterials with novel nano-optical, drug delivery and biocatalytic functions.

Short Bio

Oleg Gang is a professor of Chemical Engineering and Applied Physics and Materials science at Columbia University, as well as a leader of the Soft and Bio-Nanomaterial Group at Brookhaven National Laboratory's Center for Functional Nanomaterials. His current research program explores novel strategies for creating nanomaterial with targeted architectures and functions. He earned his Ph.D. in physics from Bar-Ilan University, he then went onto become a postdoctoral Rothschild Fellow at Harvard University and a Distinguished Goldhaber Fellow at Brookhaven National Laboratory. Gang joined the Columbia faculty in 2016, where his group develops new strategies to create materials by design using nano-assembly approaches, and to explore their properties for photonics, sensing, catalysis and biomedical applications. Gang is a Fellow of the American Physical Society and has received numerous accolades for his work, including the Gordon Battelle Prize for Scientific Discovery and 2016 Inventor of the Year Award.

Mixed-dimensional Heterostructures for Electronic & Energy Applications

KN1: 10:30 – 11:05
Sunday, September 27, 2020
Location: RM 001

Mark Hersam

Northwestern Univ., USA
m-hersam@northwestern.edu

Abstract

Layered two-dimensional (2D) materials interact primarily via van der Waals bonding, which has created new opportunities for heterostructures that are not constrained by epitaxial growth. However, it is important to acknowledge that van der Waals interactions are not limited to interplanar interactions in 2D materials. In principle, any passivated, dangling bond-free surface interacts with another via non-covalent forces. Consequently, layered 2D materials can be integrated with a diverse range of other materials, including those of different dimensionality, to form mixed-dimensional van der Waals heterostructures [1]. Furthermore, chemical functionalization provides additional opportunities for tailoring the properties of 2D materials [2] and the degree of coupling across heterointerfaces [3]. In order to efficiently explore the vast phase space for mixed-dimensional heterostructures, our laboratory employs solution-based additive assembly. In particular, constituent nanomaterials (e.g., carbon nanotubes, graphene, transition metal dichalcogenides, black phosphorus, boron nitride, and indium selenide) are isolated in solution, and then deposited into thin films with scalable additive manufacturing methods (e.g., inkjet, gravure, and screen printing) [4]. By achieving high levels of nanomaterial monodispersity and printing fidelity, a variety of electronic and energy applications can be enhanced including photodetectors, optical emitters, supercapacitors, and batteries [5]. Furthermore, by integrating multiple nanomaterials into heterostructures, unprecedented device function is realized including anti-ambipolar transistors, gate-tunable Gaussian heterojunction transistors, and neuromorphic memtransistors [6,7]. In addition to technological implications for electronic and energy technologies, this talk will explore several fundamental issues including band alignment, doping, trap states, and charge/energy transfer across previously unexplored mixed-dimensional heterointerfaces.

[1] D. Jariwala, et al., Nature Materials, 16, 170 (2017).
[2] S. Li., et al., ACS Nano, 14, 3509 (2020).
[3] S. Padgaonkar, et al., Accounts of Chemical Research, 53, 763 (2020).
[4] G. Hu, et al., Chemical Society Reviews, 47, 3265 (2018).
[5] W. J. Hyun, et al., ACS Nano, 13, 9664 (2019).
[6] M. E. Beck, et al., Nature Communications, 11, 1565 (2020).
[7] V. K. Sangwan and M. C. Hersam, Nature Nanotechnology, 15, 517 (2020).

Short Bio

Mark C. Hersam is the Walter P. Murphy Professor of Materials Science and Engineering and Director of the Materials Research Center at Northwestern University. He also holds faculty appointments in the Departments of Chemistry, Applied Physics, Medicine, and Electrical Engineering. He earned a B.S. in Electrical Engineering from the University of Illinois at Urbana-Champaign (UIUC) in 1996, M.Phil. in Physics from the University of Cambridge (UK) in 1997, and a Ph.D. in Electrical Engineering from UIUC in 2000. His research interests include nanomaterials, nanomanufacturing, scanning probe microscopy, nanoelectronic devices, biosensors, and renewable energy. Dr. Hersam has received several honors including the Presidential Early Career Award for Scientists and Engineers, TMS Robert Lansing Hardy Award, AVS Peter Mark Award, MRS Outstanding Young Investigator, U.S. Science Envoy, MacArthur Fellowship, AVS Medard W. Welch Award, and eight Teacher of the Year Awards. An elected member of the National Academy of Inventors, Dr. Hersam has founded two companies, NanoIntegris and Volexion, which are commercial suppliers of nanoelectronic and battery materials, respectively. Dr. Hersam is a Fellow of MRS, AVS, APS, AAAS, SPIE, and IEEE, and also serves as an Associate Editor of ACS Nano.

Compact, Low-power/Self-powered Gas Sensors Enabled by MEMS Platform & Functional Nanostructures

KN2: 11:05 – 11:40
Sunday, September 27, 2020
Location: RM 001

Inkyu Park

Korea Advanced Inst. of Science & Technology, Korea
inkyu@kaist.ac.kr

Abstract

Real-time remote monitoring of air pollutant and toxic gases is becoming more important in the era of internet of things (IoT). In order to achieve this, compact gas sensors are often utilized. Among many important performance factors of gas sensors, power consumption is one of the key parameters. We have developed various novel sensor platforms for the low-power or self-powered gas sensors based on the following principles: (1) locally synthesized sensing nanomaterials on suspended microheaters – we utilize microfabricated heating platforms such as microscale heating plate, microscale heating membrane, or microscale strip type heaters for the local hydrothermal synthesis and integration of sensing nanomaterials such as ZnO nanowires, SnO2 nanotubes, CuO nanowires, or TiO2 nanotubes [1]; (2) self-heated and suspended nanowires – we utilize Joule heated silicon nanowire or nanomesh structures that are functionalized with palladium nanoparticles for the low-power, sensitive, and selective detection of hydrogen gas [2]; (3) photoactivated sensing nanomaterials on micro light emitting diodes – we developed semiconductor metal oxide gas sensors that are monolithically integrated on micro light emitting diode (μLED) platform for the low-power, light-activated gas sensing with need of high temperature heating activation [3]; and (4) photovoltaic current change through chemo-optical modulation of nanostructures – integration of colorimetric or optically modulating micro/nano-structures activated by target gases for the self-powered gas sensing without needs of external power sources [4].

[1] I. Cho, K. Kang, D. Yang, J. Yun, and I. Park, "Localized Liquid-Phase Synthesis of Porous SnO2 Nanotubes on MEMS Platform for Low Power,

High Performance Gas Sensors", ACS Appl. Mater. Inter. 9, 27111-27119 (2017).
[2] M. Gao, M. Cho, H. Han, Y. Jung and I. Park, "Palladium-Decorated Silicon Nanomesh Fabricated by Nanosphere Lithography for High Performance, Room Temperature Hydrogen Sensing", Small 14, 1703691 – 1703701 (2018)
[3] I. Cho, Y. C. Sim, M. Cho, Y.-H. Cho*, and I. Park, "Monolithic Micro Light-Emitting Diode/Metal Oxide Nanowire Gas Sensor with Microwatt-Level Power Consumption", ACS Sensors 5, 563-570 (2020)
[4] K.Kang, J.Park, B.Kim, K.Na, I.Cho, J.Rho, D.Yang, J.Lee, I.Park, "Self-Powered Gas Sensor Based on a Photovoltaic Cell and a Colorimetric Film with Hierarchical Micro/Nanostructures", ACS Applied Materials & Interfaces 12, 35 (2020)

Short Bio

Prof. Inkyu Park received his B.S., M.S., and Ph.D. from KAIST (1998), UIUC (2003) and UC Berkeley (2007), respectively, all in mechanical engineering. He has been with the department of mechanical engineering at KAIST since 2009 as a faculty and is currently a full professor. His research interests are nanofabrication, smart sensors, nanomaterial-based sensors and flexible & wearable electronics. He has published more than 115 international journal articles (SCI indexed) and 150 international conference proceeding papers in the area of MEMS/NANO engineering (h index=36, total citation >7000). He is a recipient of IEEE NANO Best Paper Award (2010), HP Open Innovation Research Award (2009-2012), KINC Fusion Research Award (2016, 2018), Grand Prize of KAIST School of Engineering Research Innovation Award (2020), and Excellent Researcher Award from the Society of Micro/Nano-Systems of Korea (2020).

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On-chip Vasculature for Three-dimensional Tissue Culture & Microphysiological Systems

KN3: 10:10 – 10:45
Monday, September 28, 2020
Location: RM 001

Ryuji Yokokawa

Kyoto Univ., Japan
yokokawa.ryuji.8c@kyoto-u.ac.jp

Abstract

Micro/nano fabrication technologies have prevailed among many biological research disciplines. Expecting that micro/nano fabrications can be a powerful assay platform, our group has been focusing on applicability of fabrication technologies to multi-scale biomaterials from proteins to cells. We currently have two research directions: One is patterning methods for motor proteins that contribute to their biophysical studies. We developed a molecular sorter to separate microtubules depending on their electro-mechanical properties [1,2], and to visualize motors and ATP at single molecule level [3]. More recently, nano-pillars were utilized to immobilize single individual motor proteins [4] and revealed that two different motor proteins behave differently [5]. In this presentation, I will mainly focus on a patterning method of endothelial cells for creating an on-chip vascular network that allows us to culture three-dimensional tissues. We developed an on-chip vascular network using human umbilical vein endothelial cells (HUVECs) and human lung fibroblasts (hLFs). The vascular network in Fig. 1 enables us to perfuse a spheroid for a long-term assay and evaluate angiogenic sprouts via applied shear stress [6]. The assay method was also applied to a tumor spheroid to evaluate the efficacy of an anti-tumor drug under a flow condition, which was not realized without the microfluidic device [7]. We have proposed several bioassays that create functional nanoscale systems and contribute to understanding of in vivo functions of motor proteins and endothelial cells. We keep exploring how micro/nano fabrications can deepen science both at molecular and cellular scale.

[1] N. Isozaki et al., Sci. Rep., 5, 7669, 2015.
[2] N. Isozaki et al., Sci. Robot., 2, 10, eaan4882, 2017.
[3] K. Fujimoto et al., ACS Nano, 12, 12, 11975–11985, 2018.
[4] T. Kaneko et al., Nanoscale, 11, 9879-9887, 2019.
[5] T. Kaneko et al., Sci. Adv., 6, 4, eaax7413, 2020.
[6] Y. Nashimoto et al., J. Vis. Exp., 134, e57242, 2018.
[7] Y. Nashimoto et al., Biomaterials, 229, 119547, 2020.

Short Bio

Ryuji Yokokawa is a Professor at Department of Micro Engineering, Kyoto University, Japan, and a Visiting Researcher at RIKEN Center for Biosystems Dynamics Research (BDR), Japan. He received his Ph.D. degree in Department of Electrical Engineering from The University of Tokyo in 2005. He was a visiting student in Prof. C.J. Kim's group, Department of Mechanical and Aerospace Engineering, University of California, Los Angeles (2000–2001) and a visiting scholar with Prof. S. Takayama, Department of Biomedical Engineering, University of Michigan (2011–2012). He has authored or co-authored more than 76 peer-reviewed journal and 116 conference papers, 1 book chapter, and has 6 patents issued or pending. He has served as a technical or organizing committee member in international conferences including Transducers, MicroTAS, IEEE NEMS, MEMS, Sensors and NANOMED.

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AgNPs Embedded in Silica Matrix: A way to Impair the Microbial Adhesion on Dielectric Surfaces

KN4: 10:45 – 11:20
Monday, September 28, 2020
Location: RM 001

Kremena Makasheva

LAPLACE, Université de Toulouse, France
kremena.makasheva@laplace.univ-tlse.fr

Abstract

The emergence and selection of antibiotic-resistant bacteria is an ever increasing Public Health problem. Microbial adhesion and subsequent biofilm formation are at the origin of hospital-acquired

infections (HAIs), known also as healthcare-associated infections (HCAIs), often leading to septic complications and even lethal issues and entailing large economical losses for the health-care systems. This threat is of particular concern when compared with the very limited number of new antimicrobial agents in the pipeline of the pharmaceutical industry and the ability of micro-organisms to be less sensitive under biofilm organization. In this context, new strategies oriented to the prevention of environmental contamination of medical devices, catheters, implants, etc., are under scrutiny. A possible solution is related to silver nanoparticles (AgNPs)-containing surface coatings as antimicrobial agents. The AgNPs are embedded in the coating and progressively conducted to the surface, thus providing continuous inhibition of the microbial adhesion over long term.

Silver, and particularly AgNPs, exhibit inherent antimicrobial properties. Recently, the AgNPs proved the largest antimicrobial activity against bacteria, viruses and eukaryotic micro-organisms. The biological activity of AgNPs is closely related to ionic Ag (Ag+) release or to direct contact of the micro-organisms with AgNPs, resulting in protein denaturation at different cell locations. On the other hand, the uncontrolled use of AgNPs hides environmental risks due to the AgNPs-toxicity. Modulation of the silver ion release from AgNPs allows delivery of the appropriate dose of Ag+ for biomedical uses and environmental protection. The successful and sustainable use of nanocomposite materials containing AgNPs is mostly supported by the knowledge of how to use them safely prior to their large distribution. To that end a better understanding of the molecular mechanisms of interaction of AgNPs with micro-organisms, considering also the environment (presence of proteins of different nature), is highly demanded in order to better describe the AgNPs antimicrobial activity.

In this work we exploit the multifunctionality of AgNPs as plasmonic antenna when embedded at a controlled nanometric distance from the free surface of thin SiO2 layers and as biocide agents because of their strong toxicity towards micro-organisms to study the adhesion of Candida albicans IP48.72 on dielectric surfaces. The present study focuses on evaluation of the shear-induced detachment of the yeast C. albicans in contact with plasma mediated thin silica (SiO2) layers containing AgNPs. The experiments are performed in presence of two different proteins, Bovin Serum Albumin (BSA) and Fibronectin (Fn), to assess their respective contributions. The environment alters the C. albicans adhesion on solid surfaces depending on the protein nature. Through the release of Ag+ ions, the AgNPs embedded close to the SiO2 surface strongly reduce the adhesion forces of C. albicans and lead the dead of adhered cells. Surprisingly, cell death does not weaken the major impact of protein nature on cell adhesion. Further work will be directed to consideration of more complex protein organizations, such as intermixed proteins/proteins and proteins/micro-organisms systems.

Short Bio

Kremena MAKASHEVA is Senior Researcher at CNRS, Laboratory on Plasma and Conversion of Energy (LAPLACE), Toulouse, France. She obtained a Ph.D. degree on Plasma Physics from Sofia University, Bulgaria, 2002, for her work on surface wave sustained plasmas. In 2003 she joined Université de Montréal, Canada for almost 4 years to work on surface wave plasmas at atmospheric pressure and particularly to study the contraction phenomenon of electrical gas discharges. In 2007 she moved to Toulouse, France to work in LAPLACE laboratory on modeling microwave plasmas sustained by dipolar plasma sources. Since 2009 she works on plasma deposition of nanostructured thin dielectric layers, their characterization and analysis in relation with the dielectric charging phenomenon. Multifunctionality of silver nanoparticles (AgNPs) is in the heart of her research. In 2015 she and her colleagues proposed AgNPs-based blocking nanocomposite layer to control the transport of injected charges in thin dielectrics. Her research activities are currently directed to the study of reactive plasmas, design and elaboration of plasma deposited nanostructured dielectric materials containing AgNPs for biomedical, optical and electrical engineering applications. She serves IEEE Nanotechnology Council (IEEE NTC) with different actions, as General Chair of the 11th IEEE Nanotechnology Materials and Devices Conferences - IEEE NMDC 2016 in Toulouse and of the 16th IEEE NMDC 2021 in Vancouver, as Vice-Chair of the IEEE NTC Summer School on Nanotechnology for electronics in 2017, as Program Chair of the 20th IEEE International Conference on Nanotechnologies - IEEE NANO 2020 Virtual. Currently she is IEEE NTC Vice-President for Technical Activities 2020-2021.

Metamaterial Devices: Integrating Microsystems with Metamaterials

KN5: 09:15 – 09:50
Tuesday, September 29, 2020
Location: RM 001

Xin Zhang

Boston Univ., USA
xinz@bu.edu

Abstract

Metamaterials that exhibits unprecedented effective properties have been developed for two decades. The focus of metamaterials is shifted to constructing functional metamaterial devices by including reconfigurability, tunability and nonlinearity in metamaterial unit cells. Herein, I will introduce terahertz devices based on the tunable metamaterials to dynamically control the propagation of terahertz waves by MEMS driven unit cell structures. Nonlinear metamaterials for terahertz detection will also be discussed. In addition, I will discuss our recent intelligent radio frequency (RF) metamaterials to improve the signal to noise ratio (SNR) of magnetic resonance imaging (MRI) and implement nonreciprocal power transmission. Besides electromagnetic metamaterials, acoustic metamaterials for sound wave manipulation and noise reduction will be presented. The future of functional metamaterial devices will be outlooked.

Short Bio

Xin Zhang is a Professor of Mechanical Engineering, Electrical & Computer Engineering, Biomedical Engineering, Materials Science & Engineering, and the Photonics Center at Boston University. Her research interests are in the broad areas of metamaterials and microelectromechanical systems. She is an elected Fellow of AAAS, AIMBE, APS, ASME, IEEE, NAI, and OSA. Recently, Dr. Zhang's work on metamaterials, 1) acoustic metamaterials that enable highly efficient, air-permeable sound silencing and noise reduction and 2) magnetic metamaterials markedly boost MRI signal-to-noise ratio and thus significantly improve the performance of MRI, has drawn significant worldwide interest from the scientific community and industry, with the stories having been picked up by 200+ media outlets.

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Nanocatalysts for Electrochemical Energy Conversion Reactions

KN6: 10:00 – 10:35
Tuesday, September 29, 2020
Location: RM 001

Bing Joe Hwang

Nat'l Taiwan Univ. of Science & Technology, Taiwan
bjh@mail.ntust.edu.tw

Abstract

Electrochemical energy conversion technology is considered one of the most important technologies in today's green and sustainable energy science. Our research work has focused on a wide range of nano-electrocatalysts for electrochemical conversion reactions. Our group has established both experimental and computational strategies for the development of advanced energy materials. Our recent development in advanced energy materials for electrochemical conversion reactions includes hydrogen evolution reaction (HER), hydrogen oxidation reaction (HOR), oxygen reduction reaction (ORR), oxygen evolution reaction (OER) and CO2 reduction. Our work has led to a better understanding of electrochemical reaction mechanisms and to an improved ability to predict the properties of potential new materials. Bifunction catalysts of ORR and OER will be presented in this talk.

Short Bio

Prof. Hwang currently holds the National Chair Professorship from the Ministry of Education (Taiwan) and University Chair Professor at NTUST. He is the principal investigator of the NanoElectrochemistry Laboratory for Energy Storage and Conversion at NTUST. He has devoted himself to the electrochemical research for decades focusing on the understanding electrochemical reactions by various in-situ spectroscopic techniques, such as in-situ X-ray absorption spectroscopy, in-situ Raman spectroscopy, in-situ IR spectroscopy and so on. Prof. Hwang has explored the 'nanoscience' underpinning in reactions and interfacial phenomena directly related to electrochemical systems and contributed significantly to the development of lithium ion batteries and fuel cells. Prof. Hwang has continued to pursue his academic role with vigour and zeal and has published more than 420 peer-reviewed high-quality journal publications plus book chapters, review articles and patents. His work has been cited more than 18444 times with H-index of 68 (Scopus).

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Replacing Silicon with Carbon Nanotubes in Logic Transistors

KN7: 10:35 – 11:10
Tuesday, September 29, 2020
Location: RM 001

Qing Cao

University of Illinois at Urbana-Champaign, USA
qingcao2@illinois.edu

Abstract

The first carbon nanotube transistors were reported more than 20 years ago. Since then, they have been suggested to hold great promise of revolutionizing microelectronics, with carbon nanotube's unique and exceptional electrical properties. Although the actual progress is somewhat slower than the original expectation, carbon nanotube transistors are finally close to the tipping point of becoming a real technology. Here I will discuss why carbon nanotube transistors are one of the most promising candidates to take torch from silicon as the channel material in the next-generation extremely scaled logic devices, from industrial and technology-development perspective. The recent progress on the processing of carbon nanotubes, from their purification, assembly, to device integration, further indicates that replacing silicon with carbon nanotubes is not only physically plausible but also technically feasible. A concluding discussion provides perspectives on the future of carbon nanotube based nanoelectronics.

Short Bio

Qing Cao is an associate professor of Materials Science and Engineering and, by courtesy, of Chemistry and Electrical Engineering at the University of Illinois at Urbana-Champaign. Prior to joining Illinois in 2018, Cao was a research scientist in the Department of Physical Sciences at IBM Thomas J. Watson Research Center. He received his B.Sc. in Chemistry from Nanjing University in 2004 and his Ph.D. in Materials Chemistry from the University of Illinois at Urbana-Champaign in 2009. Cao's interdisciplinary research focus on developing functional nanomaterials for unconventional electronic systems, high-performance logic devices, and low-cost energy harvesting. He has published over thirty research papers; is co-inventor on fifty patents and patent applications. Cao's research has received recognitions including the IBM Pat Goldberg Memorial Best Paper Award (2017), IBM Master Inventor Award (2016), IBM Research Division Award (2016), US Frontiers of Engineering by National Academy of Engineering (2016, 2019), IBM Outstanding Technical Achievement Award (2015), and IBM Invention Achievement Awards (2011-2018, 17 times). He made Forbes's list of "30 Under 30" for 2012 in the Science category, as "the field's brightest stars under the age of 30 representing the entrepreneurial, creative and intellectual best of their generation", and further received the distinction of this list's "Most Influential All-Star Alumni" in 2016. MIT Technology Review listed him in 2016 as one of the top thirty-five global innovators under the age of thirty-five (TR35). The Atlantic Council selected him in 2017 as one of 21 "rising leaders and innovators around the world committed to achieving transformational change with a global impact" (Millennium Fellow).

Mechanical Design Strategies for DNA Origami Nanostructures

KN8: 09:15 – 09:50
Wednesday, September 30, 2020
Location: RM 001

DO-NYUN KIM

Seoul Nat'l Univ., Korea
dnkim@snu.ac.kr

ABSTRACT

In this presentation, we introduce our mechanical design strategies of constructing DNA origami nanostructures to achieve finer control on their geometrical shape and mechanical properties. For example, we utilize DNA strand breaks as mechanical defects (possessing lower stiffness values than normal DNA base pairs) to modulate overall bundle properties, we design modular blocks consisting of dsDNA and ssDNA that serve as a mechanical hinge or joint with a desired stiffness, and we program the locations of inserted/deleted base pairs to introduce various level of mechanical strains to helices enabling the precise tuning of bent and/or twisted shape. Multiscale analysis is heavily used in our design process where molecular level simulation is performed to characterize the unknown mechanical properties of structural components that are fed into the finite-element-based structural model for rapid prediction of their effect on overall shape and properties of DNA origami nanostructures. We expect our mechanical design strategies as well as multiscale analysis framework offer a versatile way of controlling not only the shape but also the mechanical properties (and hence the derived properties) with precision.

SHORT BIO

Do-Nyun Kim received the B.S and M.S. degrees in the Department of Mechanical and Aerospace Engineering from Seoul National University, Republic of Korea in 2000 and 2002, respectively, and the Ph.D. degree in the Department of Mechanical Engineering at Massachusetts Institute of Technology in 2009. He was a post-doctoral associate in the Department of Biological Engineering at Massachusetts Institute of Technology until January 2013. At present, he is an Associate Professor and Associate Department Chair of the Department of Mechanical Engineering at Seoul National University. His research interests span various areas of structural analysis and design at multiple scales including structural DNA nanotechnology and mechanical metamaterials.

Biocomputation with Nano/Micro Biological Agents Exploring Physical Networks

KN9: 09:50 – 10:25
Wednesday, September 30, 2020
Location: RM 001

DAN V. NICOLAU

McGill Univ., Canada
dan.nicolau@mcgill.ca

ABSTRACT

On-chip network-based computation, using biological agents, is a new hardware-embedded approach which attempts to find solutions to combinatorial problems, in principle, in a shorter time than the fast, but sequential, electronic computers. This review starts by describing the underlying mathematical principles, presents several types of combinatorial (including NP-complete) problems and shows current implementations of proof of principle developments. Taking the Subset Sum Problem, one of the oldest NP-complete problems, as example for in-depth analysis, the review presents various options of computing agents, and compares several possible operational 'run modes' of network based computer systems. Given the 'brute force' approach of network based systems for solving a problem of input size N, 2N solutions must be visited. As this exponentially increasing workload needs to be distributed in space, time, and per computing agent, this review identifies the scaling related key technological challenges in terms of chip fabrication, readout reliability and energy efficiency. The estimated computing time of massively parallel or combinatorially operating biological agents is then compared to that of electronic computers. Among future developments which could considerably improve network-based computing, labelling agents 'on the fly' and the readout of their travel history at network exits could offer promising avenues for finding hardware-embedded solutions to combinatorial problems.

SHORT BIO

Prof. Dan V. Nicolau, PhD (ChemEng), MEng (PolymSci), MS (Cybernetics), is Maria Zelenka Roy Chair of Bioengineering, the founding Chair of the Department of Bioengineering at McGill University. He authored more than 120 scientific articles, approximately 100 conference papers and 6 book chapters. His present research comprises energy- and computationally-efficient biocomputation devices using biological agents e.g., protein molecular motors, bacteria; 'intelligent' behavior of microorganisms in microfludics; and biosimulation of traffic networks by microorganisms. Prof. Nicolau is also the present Editor in Chief of IEEE Transactions on BioNanoScience.

Wearable Multifunctional Micro/Nanosystems

IS1: 12:10 -13:50
Sunday, September 27, 2020
Location: RM 001

Session Chair: Wei GAO
California Inst. of Technology, USA

Description

This session covers the topics related to the new generations of wearable and flexible micro/nanosystems for energy harvesting, health monitoring, and robotic applications. This session aims to facilitate discussion on the challenges in the field of wearable micro/nanosystems at materials, devices, and system levels. Interdisciplinary research related to fundamental mechanisms, materials development, device optimization, system level engineering, and practical biomedical applications will be connected by invited talks to facilitate the development of these multifunctional microsystems toward practical applications.

IS1.1 Wireless E-tattoos, Nanshu LU; Jonathan WELLS, Univ. of Texas at Austin, USA (invited)

IS1.2 Stretchy rubbery electronics and integrated systems, Cunjiang YU, Univ. of Houston, USA (invited)

IS1.3 Smart and connected soft bioelectronics for advancing human healthcare and human-machine interfaces, Woon-Hong YEO, Georgia Inst. of Technology, USA (invited)

IS1.4 Skin-interfaced wearable sweat biosensors, Wei GAO, California Inst. of Technology, USA (invited)

IS1.5 Smart textiles for personalized health care, Jun CHEN, Univ. of California at Los Angeles, USA (invited)

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Microbiosensors

IS2: 12:10 -13:50
Sunday, September 27, 2020
Location: RM 002

Session Chair: Gwo-Bin LEE
Nat'l Tsing Hua Univ., Taiwan

Description

This session consists of five invited talks which cover the topics from nanosensors using triboelectricity, magneto-electrochemistry, microfluidic peptide enrichment, paper-based approach and impedance-sensing for a variety of biological applications, including liquid biopsy, peptide detection, COVID-19 and cancer diagnosis. Multi-disciplinary integration of sensing techniques may open up a new route for biosensing.

IS2.1 Enhanced sensing performance of triboelectric nanosensors by solid-liquid contact electrification, Zong-Hong LIN, Nat'l Tsing Hua Univ., Taiwan (invited)

IS2.2 Integrated magneto-electrochemical sensing platform for liquid biopsy molecular profiling, Hsing-Ying LIN, Nat'l Tsing Hua Univ., Taiwan (invited)

IS2.3 Rapid peptide enrichment microfluidic chip for MALDI-TOF mass spectrometer detection, Yen Heng LIN, Chang Gung Univ.; Chang Gung Memorial Hospital, Taiwan (invited)

IS2.4 IL-6 diagnostic device for COVID-19 and its clinical validation, Chao-Min CHENG, Nat'l Tsing Hua Univ., Taiwan (invited)

IS2.5 Impedimetric monitoring of cancer cells in 3D environment, Kin Fong LEI, Chang Gung Univ., Taiwan (invited)

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Nanomaterials and Nano-/ Micro-Devices for Biosensing

IS3: 12:10 -13:50
Sunday, September 27, 2020
Location: RM 003

Session Chair: Jun LI
Kansas State Univ., USA

Description

This session consists of three invited speakers to present their leading research to interface engineering and biomedical studies. The presentations are focused on the recent development in biosensors based on nanomaterials and nano-/ micro- devices for manipulation and detection of biomarkers and pathogens. The scope covers biosensing platforms using nanoscale materials based on different electrical and electrochemical transducing mechanisms.

IS3.1 Biosensors based on indium oxide nanoribbons, Chongwu ZHOU, Univ. of Southern California, USA (invited)

IS3.2 Introducing the Virus BioResistor (VBR): The world's simplest biosensor, Reginald M. PENNER, Univ. of California at Irvine, USA (invited)

IS3.3 Profiling protease activities using a multiplex electrochemical sensor array, Jun LI, Kansas State Univ., USA (invited)

IS3.4 Hysteresis-free flexible strain sensor based on wavy-structured conductive microchannel, Jing CHEN; Zebang LUO; Lin LI; Yi SU; Jinjie ZHANG; Jinyong ZHANG; Lei WANG; Hui LI, Shenzhen Inst. of Advanced Technology, Chinese Academy of Sciences; Shenzhen Technology Univ., China (Paper - 4)

IS3.5 Near full light absorption and charge collection in 1-micron thick QD film photodetectors using intercalated graphene electrodes, Seungbae AHN; Wenjun CHEN; Oscar VAZQUEZ MENA, Univ. of California at San Diego, USA (Paper - 84)

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Active Biomaterials for Diagnosis and Therapies

IS4: 11:30 -13:10
Monday, September 28, 2020
Location: RM 001

Session Chairs: Hyunjoon KONG
Univ. of Illinois, Urbana-Champaign, USA
Sung Gap IM
Korea Advanced Inst. of Science & Technology, Korea

Description

This session aims to introduce current top-notch studies on the "Active Biomaterial" used in diagnosis and therapies. Active material encompasses natural or synthetic materials that exhibit autonomous machinery activities including propulsion, pumping, actuation, and transformation. Due to these unique properties and functions, these materials are increasingly garnering attention in biomedical studies. Therefore, this session plans to put experts together and discuss novel strategies to improve nanoscale assembly and functionality of active biomaterials towards enhanced diagnosis or treatment of various diseases. This session would offer a good opportunity to allow the audience to hear current advancements and future perspectives in active biomaterials.

IS4.1 Biomaterial enabled translational medicine, Shiny VARGHESE, Duke Univ., USA (invited)

IS4.2 Collective electrostatic migration of active epithelial cells, Jennifer H. SHIN, Korea Advanced Inst. of Science & Technology, Korea (invited)

IS4.3 Engineering materials that are responsive to disease metabolites, Szu WANG, Univ. of California at Irvine, USA (invited)

IS4.4 Nanotopographical cues for engineering cellular behaviors and tissue regeneration, Jangho KIM, Chonnam Nat'l Univ., Korea (invited)

IS4.5 Microenvironment responsive biomaterials modulating inflammatory immune cells, Nisarg SHAH, Univ. of California at San Diego (invited)

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Impedance Based Biosensors

IS5: 11:30 -13:10
Monday, September 28, 2020
Location: RM 002

Session Chairs: Mahmoud ALMASRI
Univ. of Missouri, USA

Description

This session will focus on the design, fabrication, and validation of biosensing technologies that are based on Electrochemical Impedance Spectroscopy (EIS) as the main transduction mechanism.

The sensor can be used for single or simultaneous detection of pathogenic cells, toxins, and viruses under field conditions or point-of-care applications. It utilizes a broad range of biological recognition components such as antibodies, enzymes, nucleic acids, cells, or receptors, novel electrode designs and surface functionalization techniques to achieve high sensitivity and selectivity. Both experimental and theoretical works are welcome.

IS5.1 Impedance-based and electrochemical sensors for label-free and in situ probing of bacterial response to environmental stressors, Aida EBRAHIMI, Pennsylvania State Univ., USA (invited)

IS5.2 Makerspace micro/nanofabrication technologies for 2D, 3D and nanoscale electrodes for interfacing with electrogenic cells, Swaminathan RAJARAMAN, Univ. of Central Florida, USA (invited)

IS5.3 Rapid label-free tools for health and environmental monitoring, Mehdi JAVANMARD, Rutgers Univ., USA (invited)

IS5.4 AC electrokinetics-enhanced capacitive detection of pathogenic virions and viral nucleic acids, Jayne WU, Univ. of Tennessee, USA (invited)

IS5.5 Impedance biosensor for rapid simultaneous detection of waterborne pathogens, mahmoud ALMASRI, Univ. of Missouri, USA (invited)

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Emerging Materials & Flexible Electronics

IS6: 11:30 -13:10
Monday, September 28, 2020
Location: RM 003

Session Chair: Yunlong ZI
Chinese Univ. of Hong Kong, China

Description

Flexible electronics can be achieved by either assembling electronics and circuits in flexible substrates or making electronic devices flexible by themselves. The development of these flexible electronics highly relies on the emerging materials, which have intensively studied in recent years. This session will introduce several emerging developments in material, device, and even system levels.

IS6.1 Biomimetic polymer electronics for interfacing with biological systems, Sihong WANG, Univ. of Chicago, USA (invited)

IS6.2 Hierarchical-structural Ultrathin flexible electrostatic actuators for microrobots, Hongqiang WANG, Southern Univ. of Science & Technology, China (invited)

IS6.3 Smart Textiles towards sustainable energy future, Jun CHEN, Univ. of California at Los Angeles, USA (invited)

IS6.4 Silicon nanowire photodiodes with whispering gallery modess, Myunghae SEO; Chang-Ki BAEK, Pohang Univ. of Science & Technology, Korea (invited)

IS6.5 Origami and kirigami enabled electronics, Jhonathan P. ROJAS, King Fahd Univ. of Petroleum & Minerals, Saudi Arabia (invited)

Advances in 2D Materials & Their Applications

IS7: 11:20 -13:00
Tuesday, September 29, 2020
Location: RM 001

Session Chair: Dong LIN
Kansas State Univ., USA

Description

This session focus on 2D materials and their broader applications. Since the first successful synthesis of graphene over a decade ago, a variety of 2D materials (e.g., transition metal-dichalcogenides, hexagonal boron-nitride, etc.) The semiconductor industry embraces the advent of 2D materials due to their superior electric, optic, chemical, and thermal properties. This session will invite speakers to share their latest discovery in their groups.

IS7.1 Thermal conductivities and interfacial thermal conductance of one atomic layer WSe_2, Yingtao WANG; Yuan GAO; Elham EASY; Eui-Hyeok YANG; Baoxing XU; Xian ZHANG, Stevens Institute of Technology; Univ. of Illinois at Urbana–Champaign; Univ. of Virginia, USA (invited; Paper-1127)

IS7.2 Measuring slip-mediated bending in 2D materials and heterostructures via scanning transmission electron microscopy, Pinshane Y. HUANG; Edmund HAN; Jaehyung YU; Emil ANNEVELINK; Jangyup SON; Dongyun A. KANG; Mohammad A. HOUSSAIN; Kenji WATANABE; Takashi TANIGUCHI; Elif ERTEKIN; Arend M. van der ZANDE, Univ. of Illinois at Urbana-Champaign, USA (invited)

IS7.3 Two-dimensional transition metal carbides (MXenes): From mechanics to electro-chemical sensing, Chenglin WU, Missouri Univ. of Science & Technology, USA (invited)

IS7.4 Robust highly stretchable supercapacitors enabled by MXene-reduced graphene oxide composite, Changyong CAO, Michigan State Univ., USA (invited)

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Micro/Nano Engineering for Advanced Bio/Medical Systems

IS8: 11:20 -13:00
Tuesday, September 29, 2020
Location: RM 002

Session Chair: Yoshikazu HIRAI
Kyoto Univ., Japan

Description

Microelectromechanical systems (MEMS) researchers interact across disciplines to enhance and strengthen the potential of micro/nano technologies in revolutionizing the fields of medicine and biological sciences through the development of new tools, devices, and technologies. This session is organized six energetic MEMS researchers in Japan and highlights recent advances in the field of microfabrication technologies and the state of the art in bio/medical applications such as Sensors/Microrobots for clinical use, and Microfluidic Platforms for biotechnology.

IS8.1 Controlled embryo implantation by using soft microrobot for safer reproductive medicine, Masashi IKEUCHI, Univ. of Tokyo, Japan (invited)

IS8.2 Non-invasive biosensing for healthcare and sports applications, Kiroyuki KUDO, Meiji Univ., Japan (invited)

IS8.3 Se/Ga_2O_3 thin film micro-photodiodes for flexible color sensor, Taizo KOBAYASHI, Ritsumeikan Univ., Japan (invited)

IS8.4 Plant-on-a-chip: Applications of microfluidics in plant biology, Hirotaka HIDA, Kobe Univ., Japan (invited)

IS8.5 MEMS liquid cell for in-liquid electron microscopy, Tadashi ISHIDA, Tokyo Inst. of Technology, Japan (invited)

IS8.6 Microfluidic platform fabricated by three-dimensional lithography enables drug test and disease modeling in vitro, Yoshikazu HIRAI, Kyoto Univ., Japan (invited)

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Micro-Nano Engineering & Smart Electronics

IS9: 11:20 -13:00
Tuesday, September 29, 2020
Location: RM 003

Session Chair: Xiaosheng ZHANG
Univ. of Electronic Science & Technology, China

Description

As the fundament and essence of MEMS/NEMS, the intensive innovation of micro-nano engineering greatly promoted it to experience a blooming development in the past decade. Consequently, the emerging electronic devices and systems, which could autonomously monitor and respond the environmental stimulus, including advanced sensors, self-driven actuators, self-powered microsystems, etc., are proposed and widely investigated. Therefore, this session focuses on the latest development and findings of micro-nano engineering and smart electronics.

IS9.1 Nanomechanical and nanoelectromechanical devices based on layered two-dimensional materials, Zenghui WANG, Univ. of Electronic Science & Technology, China (invited)

IS9.2 Tribotronics for active mechanosensation and self-powered microsystems, Chi ZHANG, Chnese Academy of Sciences, China (invited)

IS9.3 Graphene plamons modulated by Periodically polarized ferroelectric domains for tunable infrared photodetector, Wen HUANG, Univ. of Electronic Science & Technology, China (invited)

IS9.4 Triboelectrification based flexible sensor and its hybridized sensors towards multiple-functional robotic tactile sensing, Bo MENG, Shenzhen Univ., China (invited)

IS9.5 Multimodal, multilayered soft electronics in advanced devices for cardiac surgery, Mengdi HAN, Northwestern Univ., USA (invited)

IS9.6 Self-powered smart electronics based on silk fibroin, Xiaosheng ZHANG, Univ. of Electronic Science & Technology, China (invited)

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Single-Cell Analysis

IS10: 11:35 - 13:15
Wednesday, September 30, 2020
Location: RM 001

Session Chair: Tuhin Subhra SANTRA
Indian Inst. of Technology, Madras, India

Description

This session will deliberate the research related to micro or nanosystems dealing with single-cell manipulation, separation, lysis, dynamics of a single cell with the use of micro/nanofluidic devices combined with various detection schemes. Single-cell therapy using different physical approaches and its applications in medicine, as well as deep learning model to classify breast cancer cell types will also be discus. The future challenge for single-cell analysis with their advantages and limitations will elaborate.

IS10.1 Self-assembled-cells-array (SACA) system for single circulating tumor cells/microemboli (CTCs/CTM) rapid detection for cancer prognosis, Fan-Gang TSENG, Nat'l Tsing Hua Univ., Taiwan (invited)

IS10.2 Dynamic size-tracking of single cells using microfluidics-integrated microwave sensors, Selim HANAY, Bilkent Univ., Turkey (invited)

IS10.3 Deep learning classifies breast cancer cells by EGFR trajectory, Yen-Liang LIU, China Medical Univ., Taiwan (invited)

IS10.4 Massively parallel single-cell processing for innovation in medicine and engineering, Moeto NAGAI, Toyohashi Univ. of Technology, Japan (invited)

IS10.5 Single-cell micro/nano-electroporation and photoporation, Tuhin Subhra SANTRA, Indian Inst. of Technology at Madras, India (invited)

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Smart Sensors for Healthcare Applications

IS11: 11:35 - 13:15
Wednesday, September 30, 2020
Location: RM 002

Session Chair: Zong-Hong LIN
Nat'l 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 have 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.

IS11.1 Building a body area sensor network for personalized healthcare, JJun CHEN, Univ. of California at Los Angeles, USA (invited)

IS11.2 Microfluidic liquid crystal biosensing chips, Yu-Cheng HSIAO, Taipei Medical Univ., Taiwan (invited)

IS11.3 Evaluation of e-spun nanofibers for barrier Intelligent and photo-responsive nanopolypyrrole for industrial and clinical applications, Er-Yuan CHUANG, Taipei Medical Univ., Taiwan (invited)

IS11.4 Design of wearable triboelectric nanogenerator for self-powered healthcare and biomedical sensing, Yannan XIE, Nanjing Univ. of Posts & Telecommunications, China (invited)

IS11.5 Self-powered sensors based on triboelectric and thermoelectric effects, Zong-Hong LIN, Nat'l Tsing Hua Univ., Taiwan (invited)

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Energy Harvesting & Smart Systems

IS12: 11:35 - 13:15
Wednesday, September 30, 2020
Location: RM 003

Session Chair: Yunlong ZI
Chinese Univ. of Hong Kong, China

Description

With the rapid development of smart systems, trillions of devices are widely distributed in every corner of the world. Energy harvesting technologies are being rapidly developed to satisfy the power needs of electronic devices, through which energy in the ambient environment can be converted into electricity through various mechanisms. This session will focus on various types of energy harvesters toward development of smart systems

IS12.1 Vibrational energy harvesting techniques and self-powered sensing systems, Huicong LIU, Soochow Univ., China (invited)

IS12.2 Micro energy harvesting from vibration at ultra-low frequency, Fei WANG, Southern Univ. of Science & Technology, China (invited)

IS12.3 Fabrication of piezoelectric biomaterials for energy applications, Rusen YANG, Xidian Univ., China (invited)

IS12.4 Capturing energy from triboelectric nanogenerators: an emerging energy technology, Yunlong ZI, Chinese Univ. of Hong Kong, China (invited)

IS12.5 A universal standardized method for output capability assessment of nanogenerators, Xin XIA; Jingjing FU; Yunlong ZI, Huicong LIU, Chinese Univ. of Hong Kong, China, (Paper - 1051)

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IEEE-NEMS TECHNICAL SESSION

MEMS/NEMS I

TS1: 14:00 - 15:45
Sunday, September 27, 2020
Location: RM 001

Session Chair: Mahmoud ALMASRI
Univ. of Missouri, USA

TS1.1 MEMS based triaxial electrochemical seismometer, Wenjie QI; Deyong CHEN; Junbo WANG; Jian CHEN; Chao XU; Bowen LIU; Xichen ZHENG; Xu SHE; Tian LIANG, Aerospace Information Research Institute, Chinese Academy of Sciences, China (Paper - 38)

TS1.2 A MENS based electrochemical angular vibration sensor, Bowen LIU; Junbo WANG; Deyong CHEN; Jian CHEN; Chao XU; Tian LIANG; Wenjie QI; Xichen ZHENG; Xu SHE; Aerospace Information Research Institute, Chinese Academy of Sciences, China (Paper - 39)

TS1.3 A nonlinear 1D model of thermoresistive micro calorimetric flow sensor for response time improving, Zongqin KE; Xiaoyi WANG; Xuankai XU; Xuanhao CAO; Izhar; Wei XU, Shenzhen Univ.; Hong Kong Univ. of Science and Technology, China (Paper - 90)

TS1.4 UV-LED lithography system and characterization, Sabera Fahmida SHIBA; Jace BEAVERS; Diego LARAMORE; Bo LINDSTROM; James BROYLES; Corey GAITHER; Tyler HIEBER; Jungkwun KIM, Kansas State Univ., USA (Paper - 96)

TS1.5 Duhem hysteresis modeling of magnetic shape memory alloy actuator via takagi-sugeno fuzzy neural network, Chen ZHANG; Yewei YU; Jingwen XU; Zhiwu HAN; Miaolei ZHOU; Jilin Univ., China (Paper - 1025)

TS1.6 Nanogap device engineering for electrical characterisation of molecular components, Erenn ORE, Univ. of Cambridge, UK (Paper - 1120)

TS1.7 Development of the next generation microshutter arrays for space telescope applications, Meng-Ping CHANG; Regis BREKOSKY; Ari BROWN; Nicholas CONSTEN; Matthew GREENHOUSE; Gang HU; Kyowon KIM; Carl KOTECKI; Alexander KUTYREV; Mary LI; Stephan MCCANDLISS; Frederick WANG; Ed AGUAYO, NASA Goddard Space Flight Center; Johns Hopkins Univ.; Newton LLC, USA (Paper - 993)

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Sensors & Actuators I

TS2: 14:00 - 15:45
Sunday, September 27, 2020
Location: RM 002

Session Chair: Syed AZEEMUDDIN
Int'l Inst. of Information Technology, Inda

TS2.1 Ultra-high heat flux detection based on micromachined thermal couple, Annesha MAZUMDER; Azeemuddin SYED; Tapan Kumar SAU; Prabhakar BHIMALAPURAM, Int'l Inst. of Information Technology, Hyderabad, India (Paper - 31)

TS2.2 Polymer/paper-based double touch mode capacitive pressure sensing element for wireless control of robotic arm, Rishabh B. MISHRA; Wedyan BABATAIN; Nazek EL-ATAB; Aftab HUSSAIN; Muhammad HUSSAIN, Int'l Inst. of Information Technology, India; King Abdullah Univ. of Science & Technology, Saudi Arabia (Paper - 1014)

TS2.3 Wearable sensors for on-leaf monitoring of volatile organic compounds emissions from plants, Satyanarayana MORU; Hussam IBRAHIM; Liang DONG, Iowa State Univ., USA (Paper - 1045)

TS2.4 Inkjet-printed capacitive micromachined ultrasonic transducer (CMUT) for moisture sensing, Zhou ZHENG; Naeun KIM; Jiaqi WANG; William WONG; John YEOW, Univ. of Waterloo, Canada (Paper - 1052)

TS2.5 Floating gate perimeter gated single photon avalanche diodes, Mohammad Aminul HAQUE; Nicole MCFARLANE, Univ. of Tennessee, USA (Paper - 1096)

TS2.6 Enhanced PVDF electrospun nanofiber capacitive pressure sensor for wearable electronic, Romana DANOVA; Venkatadinesh AVVARI; Robert OLEJNIK; Petr SLOBODIAN; Jiri MATYAS; Dusan KIMMER, Tomas Bata Univ., Czech Republic (Paper - 1110)

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Sensors & Actuators II

TS3: 14:00 - 15:45
Sunday, September 27, 2020
Location: RM 003

Session Chair: Aaron OHTA
Univ. of Hawaii, USA

TS3.1 Ultralight weight piezoresistive spongy graphene sensors for human gait monitoring applications, Debarun SENGUPTA; Ajay Giri Prakash KOTTAPALLI, Univ. of Groningen, Netherlands (Paper - 12)

TS3.2 A fully transparent, flexible μECoG array based on highly conductive and anti-reflective PEDOT:PSS-ITO-Ag-ITO thin films, Weiyang YANG; Qi Hua FAN; Wen LI, Michigan State Univ., USA (Paper - 27)

TS3.3 Motion nonlinearity of gimbaled micromirror in omnidirectional scanning for LiDAR application, Katsuya SUZUKI; Takashi SASAKI; Kazuhiro HANE, Tohoku Univ., Japan (Paper - 32)

TS3.4 Low-cost parylene based micro humidity sensor for integrated human thermal comfort sensing, Izhar; Xiaoyi WANG; Wei XU; Hadi TAVAKKOLI; Yi-Kuen LEE, Hong Kong Univ. of Science & Technology; Shenzhen Univ., China (Paper - 63)

TS3.5 Development of an all-polyimide flexible airflow sensor for flow-velocity and flow-direction sensing, Dawei SHEN; Qipei HE; Zhiqiang MA; Yonggang JIANG, Beihang Univ., China (Paper - 83)

TS3.6 A flexible piezo-composite ultrasound blood pressure sensor with silver nanowire-based stretchable electrodes, Chang PENG; Mengyue CHEN; Hun Ki SIM; Yong ZHU; Xiaoning JIANG, North Carolina State Univ., USA (Paper - 88)

TS3.7 Capturing subtle changes during plant growth using wearable mechanical sensors fabricated through liquid-phase fusion, Hussam IBRAHIM; Satyanarayana MORU; Sung-Min KANG; Shihao YIN; Yuncong CHEN; Liang DONG, Iowa State Univ., USA (Paper - 1048)

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MEMS/NEMS II

TS4: 13:40 - 15:25
Monday, September 28, 2020
Location: RM 001
Session Chair: Mahmoud ALMASRI
Univ. of Missouri, USA

TS4.1 3D printed random lasers via fused deposition modelling (FDM), Yii-Zih CHEN; Yun-Tzu HSU; Yen-Yu LIN; Hsia-Yu LIN; Yu-Ming LIAO; Cheng-Fu HOU; Min-Hsuan WU; Wei-Ning DENG; Yang-Fang CHEN, Nat'l Taiwan Univ., Taiwan (Paper - 79)

TS4.2 Deep memcapacitive network, Dat TRAN; Christof TEUSCHER, Santa Clara Univ.; Portland State Univ., USA (Paper - 1084)

TS4.3 Characterization of trap geometry in flow through dielectrophoretic-microfluidic device for particle trapping, Mohammad Rizwen Ur RAHMAN; Tae Joon KWAK; Jörg C. WOEHL; Woo-Jin CHANG, Univ. of Wisconsin at Milwaukee; Cornell Univ., USA (Paper - 1086)

TS4.4 Fabrication of an integrated field emitter device with ultra-dense, ultra-sharp, and vertically aligned periodic silicon nanocones, Dirk JONKER; J.W. BERENSCHOT; R.M. TIGGELAAR; N.R. TAS; A. Van HOUSELT; J.G.E. GARDENIERS, Univ. of Twente, Netherlands (Paper - 1092)

TS4.5 Design and analysis of a band pass setback arming mechanism in mems safety and arming device, Hengbo ZHU; Yun CAO; Zhanwen XI; Weirong NIE, Nanjing Univ. of Science & Technology, China (Paper - 1102)

TS4.6 Mechanical properties of magnetic-field-assisted electrospun poly(vinylidene fluoride) (PVDF) nanofibers, Dingwen DENG; Hongze ZHANG; Yan ZHANG; Yin ZHANG; Kedong BI, Southeast Univ., China (Paper - 1125)

TS4.7 The process of stacked nanowire FETs with repetitive isotropic etching, Ya-Chi HUANG; Meng-Hsueh CHIANG; Shui-Jinn WANG, Nat'l Cheng Kung Univ., Taiwan (Paper - 1095)

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Micro/Nano Fabrication

TS5: 13:40 - 15:25
Monday, September 28, 2020
Location: RM 002
Session Chair: Sheng XU
Univ. of California at San Diego, USA

TS5.1 Pattern integrity evaluation method in microfabrication, Ting-Jeng LIU, Nat'l Tsing Hua Univ., Taiwan (Paper - 16)

TS5.2 A highly robust silicon nano-pillar chip for electroporation chip for delivering molecules to hela cells, Xu ZHAO; Haixiang LIU; Xiaoyi WANG; Cong ZHAO; Izhar; Benzhong TANG; Yi-Kuen LEE, Hong Kong Univ. of Science & Technology, China (Paper - 52)

TS5.3 3-D printing assisted micromachined RF patch antenna, Jun Ying TAN; Tae-Soon YUN; Mohammad ALMUSLEM; Jungkwun KIM, Kansas State Univ., USA; Honam Univ., Korea (Paper - 92)

TS5.4 Fabrication of a carbon chain based nanosensor for maximizing spatial resolution in DNA sequencing, Bo MA; Steve TUNG, Univ. of Arkansas, USA (Paper - 1035)

TS5.5 Fabrication of small-scale solid-state nanopores by dielectric breakdown, Zengdao GU; Dexian MA; Zhicheng ZHANG; Yin ZHANG; Jingjie SHA, Southeast Univ., China (Paper - 1118)

TS5.6 Performance evaluation of via-free non-spiral planar microcoils, Krishnapriya S; Rama KOMARAGIRI; Suja K J, NIT Calicut; Bennett Univ., India (Paper - 1029)

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Micro/Nano Fluidics I

TS6: 13:40 - 15:25
Monday, September 28, 2020
Location: RM 003
Session Chair: Aaron OHTA
Univ. of Hawaii, USA

TS6.1 Parallel nanoliter arrays based microfluidic device for quick antimicrobial susceptibility testing, Mohammad OSAID; Yi-Sin CHEN; Chih-Hung WANG; Anirban SINHA; Gwo-Bin LEE, Nat'l Tsing Hua Univ., Taiwan (Paper - 21)

TS6.2 A programmable nanodroplet device with direct sample-to-droplet interface toward high-throughput screening, Fangchi SHAO; Kuangwen HSIEH; Pengfei ZHANG; Aniruddha KAUSHIK; Tza-Huei WANG, Johns Hopkins Univ., USA (Paper - 22)

TS6.3 An integrated microfluidic platform for cholangiocarcinoma diagnosis from clinical bile juice by utilizing multiple affinity reagents, Tsung-Han LU; Nai-Jung CHIANG; Chien-Jui HUANG; Priya GOPINATHAN; Hsiu-Chi TU; Yi-Cheng TSAI; Yen-Shen SHAN; Shang-Cheng HUNG; Gwo-Bin LEE, Nat'l Tsing Hua Univ.; Nat'l Cheng Kung Univ. Hospital; Genomics Research Centre, Academia Sinica, Taiwan (Paper - 46)

TS6.4 A microfluidic device for induction of tumor angiogenesis, Che-Yu LIN; Wen-Chih YANG; Yu-Hsiang HSU, Nat'l Taiwan Univ., Taiwan (Paper - 97)

TS6.5 Development of a particulate-matter-collector by using a vortex-aided device with an electrostatic force, Wei-Hsuan CHANG; Yu-Hsiang HSU, Nat'l Taiwan Univ., Taiwan (Paper - 98)

TS6.6 Impedimetric quantification of cell invasion process in a hydrogel-filled microchannel, Kin Fong LEI, Chang Gung Univ., Taiwan (Paper - 996)

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Sensing Materials & Energy Devices I

TS7: 13:40 - 15:25
Monday, September 28, 2020
Location: RM 004
Session Chair: Jun LI
Kansas State Univ., USA

TS7.1 On-skin based soft triboelectric nanogenerator for electronics skin, Jiwon PARK; Da Eun KIM; Youn Tae KIM, Chosun Univ., Korea (Paper - 14)

TS7.2 Glucose abiotic fuel cell, Dominic NNANYELUGOH; Ankit BAINGANE; Peyton MIESSE; Gymama SLAUGHTER, Old Dominion Univ., USA (Paper - 17)

TS7.3 Effect of the twist rod angles on the performance of an inertial rotary electromagnetic energy harvester, Xiangtian DAI; Yifan WANG; Anxin LUO; Fei WANG, Southern Univ. of Science & Technology, China (Paper - 55)

TS7.4 A highly sensitive non-enzymatic hydrogen peroxide sensor based on palladium-gold nanoparticles, Saikat BANERJEE; Faruk HOSSAIN; Gymama SLAUGHTER, Old Dominion Univ., USA (Paper - 1006)

TS7.5 Numerical simulation of a microscale dynamo driven by tethered, magnetized bacterial cell, Jeremy MEYER; Jin-Woo KIM; Steve TUNG, Univ. of Arkansas, USA (Paper - 1049)

TS7.6 Classification and concentration prediction of VOC gas based on sensor array with machine learning algorithms, Yingming LIU; Changhui ZHAO; Junqi LI; Huimin GONG; Fei WANG, Southern Univ. of Science & Technology, China (Paper - 1010)

TS7.7 Direct graphene growth on Anodic Aluminum Oxide membrane using chemical vapor deposition for solar evaporator performance enhancement, Aamna ALSHEHHI; Irfan SAADAT; Amal ALGHAFERI, Khalifa Univ. of Science & Technology, UAE (Paper - 1032)

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Nanobiology/Nanomedicine I

TS8: 13:30 - 15:15
Tuesday, September 29, 2020
Location: RM 001

Session Chair: Nalinikanth KOTAGIRI
Univ. of Cincinnati, USA

TS8.1 Micro-scale extraction of cf-DNA from embryo culture medium using electrowetting-on-dielectric (EWOD) platform, Anand Baby ALIAS; Kai-Ti LIN; Da-Jeng YAO, Nat'l Tsing Hua Univ., Taiwan (Paper - 19)

TS8.2 Rapid enrichment of extracellular vesicles via optically-induced dielectrophoresis and microfluidics, Yi-Sin CHEN; Charles Pin-Kuang LAI; Chen-wei FAN; Chihchen CHEN; Gwo-Bin LEE, Nat'l Tsing Hua Univ.; Academia Sinica, Taiwan (Paper - 47)

TS8.3 Accelerated, reactive aging tests of parylene C, SiO2, and Si3N4 packages for chronic neural implants, Yan GONG; Matthew Harris BRAUER; Kristine ZHENG; Wen LI, Michigan State Univ.; Huron High School, USA (Paper - 50)

TS8.4 A low-drift extended-gate field effect transistor (EGFET) with differential amplifier for cordyceps sinensis DNA detection optimized by gm/ID theory, Yifan XU; Hadi TAVAKKOLI; Jingting XU; Yi-Kuen LEE, Hong Kong Univ. of Science & Technology, China (Paper - 66)

TS8.5 Effect of size of gold nanoparticles (GNP) on intracellular uptake and cytotoxicity in breast cancer cells, Yuwen ZHAO; Rui YANG; Shue WANG, Univ. of New Haven, USA (Paper - 77)

TS8.6 Bending properties of materials for peripheral nerve interfaces, Joshua WOODS; Elissa WELLE; Lei CHEN; Julianna RICHIE; Paras PATEL; Cynthia CHESTEK, Univ. of Michigan, USA (Paper - 1091)

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Nanobiology/Nanomedicine II

TS9: 13:30 - 15:15
Tuesday, September 29, 2020
Location: RM 002

Session Chair: Joshua SAKON
Univ. of Arkansas, USA

TS9.1 Flexible electrochemical lactate biosensor, Peyton MIESSE; Gymama SLAUGHTER, Old Dominion Univ., USA (Paper - 7)

TS9.2 Operation stability of chitosan and nafion-chitosan coatings on bioelectrodes in enzymatic glucose biofuel cells, Robinson KUIS; Md Qumrul HASAN; Ankit BAINGANE; Gymama SLAUGHTER, Univ. of Maryland at Baltimore County; Old Dominion Univ., USA (Paper - 9)

TS9.3 Study on magnetic properties of artificial magnets induced by ferromagnetic/ferroelectric heterojunction, Akinobu YAMAGUCHI; Ryo NAKAMURA; Shunya SAEGUSA; Naoya AKAMATSU; Aiko NAKAO; Yuichi UTSUMI; Masaki OURA; Takeshi OGASAWARA; Keisuke YAMADA; Takuo OHKOCHI, University of Hyogo; Waseda University; RIKEN S, Nat'l Inst. of Advanced Industrial Science & Technology; Gifu Univ.; Japan Synchrotron Radiation Research Inst., Japan (Paper - 57)

TS9.4 Modeling of plasmonic organic solar cells using core-shell metallic nanoparticles, Muath Bani SALIM; Reza NEKOVEI; Amit VERMA, Texas A&M Univ. at Kingsville, USA (Paper - 73)

TS9.5 3D printed micro-scaffolds loaded by inkjet printing with µg-precise amount of drug, Fengyi ZHENG; Jongmoon JANG; Christopher TSE; Juergen BRUGGER, EPFL, Switzerland (Paper - 997)

TS9.6 Synthesis and characterization of citrus-derived pectin nanoparticles based on their degree of esterification, Eden JACOB; Ankita BORAH; Amandeep JINDAL; Sindhu PILLAI; Yohei YAMAMOTO; Sakthi KUMAR, Toyo Univ.; Univ. of Tsukuba, Japan (Paper - 1093)

TS9.7 Nanorobot for cancer biomarker instrumentation, Adriano CAVALCANTI; Declan G. MURPHY; Prokar DASGUPTA, Central Washington Univ., USA; Peter MacCallum Cancer Centre, Australia; King's College London, UK (Paper - 1114)

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Micro/Nano Fluidics II

TS10: 13:30 - 15:15
Tuesday, September 29, 2020
Location: RM 003

Session Chair: Aaron OHTA
Univ. of Hawaii, USA

TS10.1 Hysteresis modeling of magnetic shape memory alloy using a NARMAX structure model, Yewei YU; Chen ZHANG; Jingwen XU; Zhiwu HAN; Miaolei ZHOU, Jilin Univ., China (Paper - 36)

TS10.2 Modular magnetic digital microfluidic platform with 3D-printed lego-like building blocks for on-demand bioanalysis, Pojchanun KANITTHAMNIYOM; Aiwu ZHOU; Yi ZHANG, Nanyang Technological Univ., Singapore (Paper - 1008)

TS10.3 Low-cost rapid prototyping of high-resolution printed liquid-metal circuits and devices, Kareem ELASSY; Jubeyer RAHMAN; Anthony W. COMBS; David G. GARMIRE; Wayne A. SHIROMA; Aaron OHTA, Univ. of Hawaii at Manoa; Univ. of Michigan at Ann Arbor, USA (Paper - 1033)

TS10.4 Intracellular delivery using anisotropic gold nanocrystals synthesized by microfluidic device, Kavitha ILLATH; Syrpailyne WANKHAR; Moeto NAGAI; Tuhin Subhra SANTRA; Pallavi SHINDE; Ashwin Kumar NARASIMHAN, IIT at Madras; CMC Vellore; Rajalakshmi Engineering College, India; Toyohashi Univ. of Technology, Japan (Paper - 1037)

TS10.5 Investigation the ionic transport and charge inversion in monovalent nanofluidic structures, Mohsen NAMI; Cody RITT; Yukun LI; Jianyu WANG; Mark REED, Yale Univ., USA; Nanchang Univ., China (Paper - 1039)

TS10.6 A review of nanofluids synthesis for oil and gas applications, Surupa SHAW, Texas A&M Univ., USA (Paper - 1119)

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Sensing Materials & Energy Devices II

TS11: 13:25 - 15:20
Wednesday, September 30, 2020
Location: RM 001

Session Chair: Sheng XU
Univ. of California at San Diego, USA

TS11.1 Development of silver-nanoparticle-based planar microcoil for electromagnetic cochlear stimulation, Ressa Reneth SARREAL; Pamela BHATTI, Georgia Inst. of Technology, USA (Paper - 10)

TS11.2 Construction of NiCe-LDH nanostructure from Ni-MOF as a positive electrode material for high-performance asymmetric supercapacitor device, Rajendran RAMACHANDRAN; Changhui ZHAO; Zong-Xiang XU; Fei WANG, Southern Univ. of Science and Technology, China (Paper - 59)

TS11.3 Dielectric constant and van der waals interlayer interaction of MoS_2-graphene heterostructures, Amit SINGH; Seunghan LEE; Hoonkyung LEE; Hiroshi WATANABE, Nat'l Chiao Tung Univ., Taiwan; Konkuk Univ., Korea (Paper - 992)

TS11.4 Electrical modeling of copper and mixed carbon bundles as a composite for 3d interconnect applications, Madhav RAO, Int'l Inst. of Information Technology at Bangalore, India (Paper - 1012)

TS11.5 Poly (vinylidene fluoride-co-hexafluoropropylene) electrospun non-woven nanofibers based piezoelectric nanogenerator, Venkatadinesh AVVARI; Robert OLEJNIK; Romana DANOVA; Jiri MATYAS; Petr SLOBODIAN; Martin ADAMEK; Dusan KIMMER, Tomas Bata Univ. in Zlin, Czechia (Paper - 1097)

TS11.6 A self-powered vehicle speed sensor based on an inertial rotary electromagnetic energy harvester, Yifan WANG; Xiangtian DAI; Anxin LUO; Fei WANG, Southern Univ. of Science and Technology, China (Paper - 1007)

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Nanomaterials/Nanomechanics I

TS12: 13:25 - 15:20
Wednesday, September 30, 2020
Location: RM 002

Session Chair: Nalinikanth KOTAGIRI
Univ. of Cincinnati, USA

TS12.1 Platinum nanoparticles decorated multiwalled carbon nanotubes and chemically modified graphene based electrochemical biosensor for highly sensitive and selective glucose detection, Faruk HOSSAIN; Insoo KIM; Gymama SLAUGHTER, Old Dominion Univ.; UConn Health, USA (Paper - 8)

TS12.2 Tuning the response of hybrid graphene/quantum dot photodetectors with QD size, film thickness and intermediate layers, Seungbae AHN; Wenjun CHEN; Oscar VAZQUEZ MENA, Univ. of California at San Diego, USA (Paper - 51)

TS12.3 Metal-organic framework derived CeO2 based two-dimensional layered nanocomposites for selective electrochemical dopamine detection, Chengjie GE; Rajendran RAMACHANDRAN; Fei WANG, Southern Univ. of Science & Technology, China (Paper - 60)

TS12.4 TDFFT studies on sheet size-dependency of optoelectronic properties of 2D silicon doped with alkali metals, MD Raiyan ALAM; Muath Bani SALIM; Ganesh ALWARAPPAN; Aashka BHANDARI; Sunil PATIL; Sherin ALFALAH; Mohamed SHIBL; Walid HASSAN; Reza NEKOVEI; Amit VERMA, Texas A&M Univ. at Kingsville, USA; College of Engineering, Pune, India; Qatar Univ., Qatar; King Abdulaziz Univ., Saudi Arabia (Paper - 995)

TS12.5 Physicochemical properties of multifunctional crosslinked cellulose nanocrystals, Joseph BATTA-MPOUMA; Joshua SAKON; Jin-Woo KIM, Univ. of Arkansas, USA (Paper - 1017)

TS12.6 Effects of commensurability on the friction and energy dissipation in graphene/graphene interface, Rong LIN; Zhiyong WEI; Yunfei CHEN, Southeast Univ., China (Paper - 1112)

TS12.7 Study of gold particles in HFSS with varying physical parameters and arrangements, Annesha MAZUMDER; Azeemuddin SYED; Tapan Kumar SAU; Prabhakar BHIMALAPURAM, Int'l Inst. of Information Technology at Hyderabad, India (Paper - 1031)

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Nanomaterials/Nanomechanics II

TS13: 13:25 - 15:20
Wednesday, September 30, 2020
Location: RM 003

Session Chair: Aaron OHTA
Univ. of Hawaii, USA

TS13.1 A wireless self-powered glucose monitoring biosystem, Ankit BAINGANE; Gymama SLAUGHTER, Old Dominion Univ., USA (Paper - 15)

TS13.2 DropPNA-GO: a single-cell uropathogen sensor based on PNA probes and graphene oxide in picoliter droplets, Pengfei ZHANG; Aniruddha KAUSHIK; Kuangwen HSIEH; Tza-Huei WANG, Johns Hopkins Univ., USA (Paper - 25)

TS13.3 2 x 3 arrayed CMOS capacitive biosensors for detection of microRNAs on a microfluidic system, Yu-Hsuan KUO; Chi-Chien HUANG; Yi-Sin CHEN; Po-Chiun HUANG; Gwo-Bin LEE, Nat'l Tsing Hua Univ., Taiwan (Paper - 54)

TS13.4 Scaling effect induced rapid quenching improves the performance of microfabricated electrostatic micromirrors, Hao REN; Weimin WANG; Haichao CAO; Sitao FEI; Yunping NIU; Zhihao LI, Inst. of Optics & Electronics, Chinese Academy of Sciences; ShanghaiTech Univ., China (Paper - 61)

TS13.5 A novel pulse heating approach for gas sensors with concentration estimation through back propagation neural network, Ye TIAN; Gaoqiang NIU; Yushen HU; Fei WANG, Southern Univ. of Science & Technology, China (Paper - 62)

TS13.6 AC electrothermal flow-enhanced, label-free immunosensor for rapid electrochemical sensing, Jiran LI; Peter LILLEHOJ, Rice Univ., USA (Paper - 76)

TS13.7 Interfacial adhesion behavior between conductive polymers and functionalized graphene via molecular dynamic simulation, Bin HU; Kedong BI, Southeast Univ., China (Paper - 1121)

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IEEE-NEMS POSTER SESSION

PS1: 11:40 -12:10
Sunday, September 27, 2020
Location: RM 001

PS1.1 The comparison of experimental and theoretical study on graphene peeling off from SiO_2, Qi ZHANG; Dongliang ZHANG; Xing PANG; Yulong ZHAO, Xi'an Jiaotong Univ., China (Paper - 23)

PS1.2 Smartphone-controlled electrochemical sensor for copper detection, Yang LI; Song YU; Jianhua TONG; Chao BIAN; Shanhong XIA; Hanpeng DONG, Aerospace Information Research Inst., Chinese Academy of Sciences; Beijing Information Science & Technology Univ., China (Paper - 44)

PS1.3 A module-level weathering and durability testing on silver nanowire transparent conductors, Chiao-Chi LIN; Bo-Ju YOU; Yu-Xuan YANG; I-Hsiang TSENG, Feng Chia Univ., Taiwan (Paper - 70)

PS1.4 Underground water flow speed and direction measurement using differential pressure sensors, Yukito FUKUSHIMA; Manami TAIE; Tomoaki KAGEYAMA; Takahiro TANI; Yuki KAJIKAWA; Masamitsu KUROIWA; Tetsuro SEIYAMA; Sang-Seok LEE, Tottori Univ., Japan (Paper - 1004)

PS1.5 Wearable self-powered pressure sensor by integration of piezo-transmittance microporous elastomer with organic solar cell, Jungrak CHOI; Donguk KWON; Byeongsu KIM; Jimi GU; Jihwan JO; Jung-Yong LEE; Inkyu PARK, Korea Advanced Inst. of Science & Technology, Korea (Paper - 1028)

PS1.6 Electrical and optoelectronic properties analysis in two-dimensional multilayer WSe2 phototransistor for high speed device applications, Avra BANDYOPADHYAY; Kishan JAYANAND; Anupama KAUL, Univ. of North Texas, USA (Paper - 1079)

PS1.7 Many-body interactions in halide-assisted CVD grown WSe_2 for high performance photodetectors, Avra BANDYOPADHYAY; Kishan JAYANAND; Anupama KAUL, Univ. of North Texas, USA (Paper - 1080)

PS1.8 Microfluidic enzymatic glucose biofuel cell with MWCNT patterned printed circuit board electrodes, Prakash REWATKAR; Sanket GOEL, Birla Inst. of Technology & Science-Pilani, Hyderabad Campus, India (Paper - 1115)

PS1.9 Optimization and characterizaton of laser-induced graphene electrodes for chemical fuel cell to realize a microfluidic platform, Lanka Tata RAO; Satish Kumar DUBEY; Arshad JAVED; Sanket GOEL, Birla Inst. of Technology & Science-Pilani, Hyderabad Campus, India (Paper - 1116)

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PS2: 13:10 -13:40
Monday, September 28, 2020
Location: RM 001

PS2.1 A novel peninsula-island structure for sensing ultra-low pressure based on dry-wet combination etching process, Mimi HUANG; Libo ZHAO; Tingzhong XU; Chen JIA; Ping YANG; Zhikang LI; Hongyan WANG; Yongshun WU; Zhuangde JIANG, Xi'an Jiaotong Univ.; Shaanxi Institute of Metrology Science, China (Paper - 33)

PS2.2 Modeling and simulation of MEMS capacitive displacement sensors, Mehadi Hasan ZIKO; Mohammed Siraj GHOURI; Ants KOEL, Tallinn University of Technology, Estonia; Chemnitz Univ. of Technology, Germany (Paper - 45)

PS2.3 Polymer micromachined transmission for insect–inspired flapping wing nano air vehicles, Daisuke ISHIHARA; Sunao MURAKAMI; Naoto OHIRA; Jyunpei UEO; Masakatsu TAKAGI; Kohei URAKAWA; Tomoyoshi HORIE, Kyushu Inst. of Technology, Japan (Paper - 56)

PS2.4 A contour mode AlN piezoelectric resonator based on SOI substrate, Sitao FEI; Hao REN, ShanghaiTech Univ., China (Paper - 1000)

PS2.5 Laser-etched grooves for sequential fluid delivery in a paper-based microfluidic device, Sidharth MODHA; Hussein CHAMOUNI; Yu SHEN; Ashok MULCHANDANI; Hideaki TSUTSUI, Univ. of California at Riverside, USA (Paper - 1041)

PS2.6 A helicopter drive control simulation system using dynamic posture surveillance feedback, Zhigang WU; Fuzheng CHEN; Kaiming XU; Xianmin PENG; Uche WEJINYA; Guangyi SHI, China Aerodynamics Research & Development Center; Peking Univ., China; Univ. of Arkansas, USA (Paper - 1068)

PS2.7 Biocompatible nanoclusters for treatment of cancer tumors with magnetic hyperthermia, Ananiya DEMESSIE; Hassan ALBARQI; Olena TARATULA; Oleh TARATULA, Oregon State Univ., USA (Paper - 1090)

PS2.8 Study on the influence of doping process on resistance of semiconductor bridge region, Youqi DENG; Liang ZHANG; Wei ZHANG, Peking Univ., China (Paper - 1100)

PS2.9 Micro-nano fiber sensor with high sensitivity for temperature measurement, Fuzheng ZHANG; Na ZHAO; Qijing LIN; Feng HAN; Libo ZHAO; Ping YANG; Zhuangde JIANG, Xi'an Jiaotong Univ., China (Paper - 1126)

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PS3: 15:10 -15:40
Monday, September 28, 2020
Location: RM 001

PS3.1 T4 bacteriophage based extended gate field effect transistors (T4B-EGFETs) for bacteria detection, Jingting XU, Yi-Kuen LEE, Hong Kong Univ. of Science & Technology, China (Paper - 40)

PS3.2 Vertically aligned carbon nanotubes for fast humidity sensing, Zichao MA; Xiaoyi WANG; Lining ZHANG, Hong Kong Univ. of Science & Technology; Peking Univ., China (Paper - 1009)

PS3.3 A comparative molecular study between chlorpyriphos and parathion using CuO nanohair pesticide sensor, Nattida RONGWAREE; Tongchatra WATCHARAWITTAYAKUL; Cholthisa SOOKSAMPHANWONG; Phichamon SAKDARAT; Seeroong PRICHANONT; Chanchana THANACHAYANONT; Porpin PUNGETMONGKOL, Chulalongkorn Univ.; National Science and Technology Development Agency, Thailand (Paper - 1034)

PS3.4 Nanosecond pulsed laser activated massively parallel single-cell intracellular delivery using Ti micro-dish, Pallavi SHINDE; Kavitha ILLATH; Srabani KAR; Tuhin Subhra SANTRA, Indian Inst. of Technology at Madras, India; Univ. of Cambridge, UK (Paper - 1036)

PS3.5 Flexural rigidity of microtubules measured by gold stripe-patterned substrate, Hang ZHOU; Naoto ISOZAKI; Kazuki UKITA; Taviare L. HAWKINS; Jennifer L. ROSS; Ryuji YOKOKAWA, Kyoto Univ., Japan; Univ. of Wisconsin at La Crosse; Univ. of Massachusetts at Amherst, USA (Paper - 1044)

PS3.6 Towards high-throughput single-cell proteomics using droplet microfluidics, Mohsen PARYAVI; Richie CHIO; M. Arifur RAHMAN; Iain MACPHERSON; Aaron T. OHTA, Univ. of Hawaii at Manoa, USA (Paper - 1046)

PS3.7 Prediction and design of breakdown voltage of MEMS spark gap switch based on BP neural network, Yuecen ZHAO; Wenzhong LOU; Hengzhen FENG; Yi SUN, Beijing Inst. of Technology, China (Paper - 1099)

PS3.8 Gas chamber and thermal isolation structure simulation for an integrated NDIR gas sensor, Kaisheng ZHANG; Wenbo LUO; Tao WANG; Jing YANG; Yupeng YUAN; Zuwei ZHANG; Yao SHUAI; Chuangui WU; Wanli ZHANG, Univ. of Electronic Science & Technology of China; China Electronics Technology Group, China (Paper - 1123)

PS3.9 Magnetic tweezers reversely manipulate the speed of DNA passing through the nanopre, Gang WANG, Southeast Univ., China (Paper - 1124)

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PS4: 13:00 -13:30
Tuesday, September 29, 2020
Location: RM 001

PS4.1 Microscopic and spectroscopic insights on the $MAPbBr_3$ nanoparticle thin film stability: role of oxygen and moisture, Amitrajit MUKHERJEE; Mrinmoy ROY; Nithin PATHOOR; Mohammed ASLAM; Arindam CHOWDHURY, Indian Inst. of Technology at Bombay, India (Paper - 94)

PS4.2 Improving photoresponse in hybrid graphene/PbS QDs using pyrene for enhanced charge collection, Maria Lucia CURRI; Seungbae AHN; Chiara INGROSSO; Oscar VAZQUEZ MENA; Marinella STRICCOLI; Annamaria PANNIELLO; Giovanni BRUNO; Giuseppe Valerio BIANCO; Angela AGOSTIANO, Univ. of Bari; CNR IPCF Italy; CNR NANOTEC Italy, Italy; Univ. of Univ. at San Diego, USA (Paper - 1011)

PS4.3 Assessing cellulose nanocrystals from different wood species as engineering materials, Gurshagan KANDHOLA; Kalavathy RAJAN; Angele DJIOLEU; Joseph BATTA-MPOUMA; Nicole LABBE; Joshua SAKON; D. Julie CARRIER; Jin-Woo KIM, Univ. of Arkansas; Univ. of Tennessee, USA (Paper - 1018)

PS4.4 Hybrid cellulose nanocrystal / gold nanoparticle nanocomposites for surface plasmon enhanced property, Mahshid IRANI-PARAST; Joseph BATTA-MPOUMA; Gurshagan KANDHOLA; Min KIM; Jaspreet KAUR; Joshua SAKON; Jingyi CHEN; Jin-Woo KIM, Univ. of Arkansas, USA (Paper - 1020)

PS4.5 Monolithic photo-activated gas sensor based on microLED and metal oxide nanowire, Incheol CHO; Young Chul SIM; Minkyu CHO; Yong-Hoon CHO; Inkyu PARK, Korea Advanced Inst. of Science & Technology, Korea (Paper - 1042)

PS4.6 The effect of substrate on the tribological properties of graphene, Xin FENG; Lingling LI; Zhiyong WEI; Guiwen ZHANG, Southeast Univ., China (Paper - 1103)

PS4.7 Molecular dynamics simulation for protein unfolding, Meng YU; Wei SI; Jingjie SHE, Southeast Univ., China (Paper - 1108)

PS4.8 Multifunctional theranostic red blood cell membrane coated nanoparticles for the treatment and detection of breast cancer, Suphalak Khamruang MARSHALL; Soracha DECHAUMPHAI, Prince of Songkla Univ.; Mahidol Univ., Thailand (Paper - 1111)

IEEE-NEMS 2021

The 16th IEEE International Conference on Nano/Micro Engineered & Molecular Systems

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Conference Scope

- Micro/Nano Electro-Mechanical Systems (M/NEMS)
- Micro/Nano/Molecular Fabrication
- Nanomaterials
- Nanophotonics & Nanoscale Imaging
- Nanoscale Robotics, Assembly & Automation
- Molecular Sensors, Actuators & Systems
- Micro/Nano Fluidics
- Micro/Nano Mechanics
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- Soft & Flexible Devices and Applications

Important Dates

Abstract Deadline: Jan. 15, 2021
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