Sungkyun International Solar Forum

SISF 2019

(www.skku-solar.org)

Halide Perovskites: Fundamentals, Photovoltaics and Opto-Electronics

600th Anniversary Hall

Sungkyunkwan University (SKKU), Seoul, Korea

June 19 (Wed)-21(Fri), 2019

The 8th Sungkyun International Solar Forum

***Organized** by*

- BK Plus, School Chemical Engineering, School of Advanced Materials Science and Engineering, Department of Energy Science, Sungkyunkwan University (SKKU)
- Global Frontier Center for Multiscale Energy Systems, Seoul National University (SNU)
- Energy Frontier Laboratory, SKKU

***Sponsored** by*

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- Korean IPS
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Welcome Address and Chronicle of SISF

It is our great pleasure to host the **8th** Sungkyun International Solar Forum (SISF2019) that is held at 600th Anniversary Hall, Sungkyunkwan University (SKKU), Seoul, Korea, from June 19 (Wed) to June 21 (Fri), 2019. The organizing committee members are very pleased to invite world-leading scientists to SISF2019. Topics on photovoltaics and opto-electronics of halide perovskite will be discussed in SISF2019.

Since 2011, SISF held annually in SKKU campus. The **first SISF** was held in Science and Engineering campus of SKKU, located in Suwon, in 2011, where world-leading experts in PV from academy and industry were invited including C. S. Choi (Samsung Electronics), A. Hagfeldt (Uppsala Univ, Sweden), A. Ebong (Univ. North Carolina, USA), C.W. Tang (Univ. Rochester, USA), K. Baert (IMEC, Germany), O. Ikki (RTS, Japan), D.L. Officer (Univ. Wollongong, Australia), M. Yamaguchi (Prof. Toyota Tech, Japan), J. van de lagemaat (NREL, USA), C.H. LEE (Dongjin Semichem, Korea), P.V. Kamat (Univ. Notre Dame, USA), D. Kim (Samsung Electronics, Korea), J. Song (KIER, Korea), J.W. Lee (LG Innotek, Korea), M. Konagai (Tokyo Tech., Japan), T. Nakada (Aoyama Univ., Japan), H.-S. Lee (Sinsung Holdings, Korea), E.-C. Cho (Hyundai Heavy Ind., Korea), J. Yi (SKKU, Korea), D.-Y. Jung (SKKU, Korea), N.-G. Park (SKKU, Korea). Since **2nd SISF in 2012**, SISF has been held in 600th anniversary hall in SKKU, Seoul. Invited speakers mainly working on dye-sensitized solar cells were composed for the SISF2012, including M. Gratzel (EPFL, Switzerland), A. Zaban (Bar-ilan Univ., Israel), Gang Li (UCAL, USA), A. Hagfeldt (Uppsala Univ., Sweden), W. You (Univ. North Carolina, USA), E. Nakamura (Univ. Tokyo, Japan), J. Zhai (Beihang Univ., China), J.H. Park (SKKU, Korea), H.S. Jung (SKKU, Korea), S.-H. Han (Hanyang Univ., Korea), P. j. Yoo (SKKU, Korea), H. Segawa (Univ. Tokyo, Japan), J.-K. Lee (Univ. Pittsburgh, USA), K. Kim (Ewha Womans Univ., Korea), S.-W. Kim (SKKU, Korea), T. Toyoda (Univ. Electro-Communications, Japan),D.-Y. Kim (GIST, Korea), M.H. Park (Samsung Fine Chemicals, Korea), T.H. Ahn (Kolon Indusries, Korea), S. Mori (Shinshu Univ., Japan), S. Ito(Univ. Hyogo, Korea). In the **3rd SISF** in 2013, topics were still related to dye-sensitized solar cells but quantum-dot and halide perovskite issues were involved. Invited speakers were M. Grätzel, N.-G. Park, A. Hagfeldt, P. Kamat, W.I. Lee (Inha Univ., Korea), S. Hayase (Kyushu Institute of Technology, Japan), J.-J. Lee (Kunkuk Univ., Korea), T. Ma (Dalian Univ, China), J. Moon (Yonsei Univ., Korea), M. Choi (SNU, Korea), S. Mhaisalkar (NTU, Singapore), S. Ito, A. Zaban, X. Zheng (Stanford Univ., USA), H. Shin, E. W.-G. Diau (National Chiao Tung Uinv. Taiwan), H. Segawa, S.I. Seok (KRICT, Korea), N.K. Park (SNU, Korea), K. Cho (POSTEC, Korea), W.-Y. Wong (National Chiao Tung Uinv. Taiwan), H. Ohkita (Kyoto Univ., Japan), J. Bisquert (Universitat Jaume I, Spain), J.-K. Lee, W.S. Shin (KRICT, Korea), B. Kim (Yonsei Univ., Korea). In the **4th SISF** in 2014, topics related to perovskite solar cell were in depth discussed, in which lectures of science and technologies toward high efficiency of perovskite solar cell were delivered by invited speakers of M. Gratzel, Y.S. Kang (Hanyang Univ., Korea), A. Hagfeldt, P. Kamat, A. Zaban, I. Mora Sero (Univ. Jaume I, Spain), E. W.-G. Diau, S. Ito, S. Hayase, S. Mhaisalkar, Y.-B. Cheng (Monash Univ., Australia), H. Míguez (CSIC-US, Spain), A.J. Frank (NREL, USA), S. Bent (Stanford Univ., USA), J.-K. Lee, H. Segawa, L. Mueller-Meskamp (IAPP, Germany), A. Wakamiya (Kyoto Univ.), P. Earis (Managing Editor, Royal Society of Chemistry), B.M. Clemens (Stanford Univ., USA), K. Zhu (NREL, USA), S. Uchida (Univ. Tokyo, Japan), T.H. Park (POSTECH, Korea), M.J. Ko (KIST, Korea). The 5th SISF in 2015 was cancelled because of MERS (Middle East Respiratory Syndrome). For this reason, the **5th SISF** was held in 2016 with topics on perovskite solar cells and related topics. World-leading scientists gave invited talks, including M. Gratzel, A. Hagfeldt, P. Kamat, A. Zaban, F. de Angelis (CNR-ISTM, Italy), Y.-B. Cheng, S.I. Seok, S. Hayase, A.M. Rappe (Univ. Pennsylvania, USA), J.E. Spanier (Drexel Univ., USA), A. Wakamiya, Y. Yang (UCLA, USA), T. Sargent (Univ. Toronto, Canada), T. Miyasaka (Toin Univ., Japan), J. Bisquert, H. Segawa, S. Mhaisalkar, D. Cahen (Weizmann

Institute of Science, Israel), CS Lee (City U, Hong Kong), S. Ito, H.S. Jung, E. Palomares (ICREA, Spain), S. Dai (North China Electric Power University, China), J. Huang (University of Nebraska-Lincoln, USA), A. Walsh (University of Bath, UK), A. Jen (University of Washington, USA), J.-K. Lee, J. van de Lagemmat. In 2017, perovskite solar cell achieved its efficiency over 22% surpassing the conventional inorganic photovoltaic technologies. For the **6th SISF** in 2017, opto-electronic properties of halide perovskite were discussed to extend its application from photovoltaics to light emitting diode, resistive memory etc. We invited M. Gratzel, T. Sargent, S.I. Seok (UNIST, Korea), Y. Yang, A. Hagfeldt (EPFL, Switzerland), P. Kamat, T. Miyasaka, N.-G. Park, T.-W. Lee (SNU, Korea), H. Han (HUST, China), F. de Angelis, H.W. Jang (SNU, Korea), S. Mhaisalkar, S. Ito, E. Palomares, S. Dai, A. Wakamiya, A. Jen, S. Uchida, J. van de Lagemmat, D. Mitzi (Duke University, USA), Y. Qi (OIST, Japan), J. Kim (MIT, USA), H. Segawa, J.S. Lee (POSTECH, Korea),H. Shin. In the 7th SISF in 2018, we invited M. Grätzel, K. Lee ,A. Wakamiya, H.J. Bolink (University of Valencia, Spain), Y. Yang, J. Huang, M. Saliba, Kylie Catchpole, K. Zhu, H. Segawa, A. Hagfeldt, Y. Qi, L. Etgar, T. Miyasaka, D.S. Ginger, K.T. Nam, P. Kamat, S. Ito, I. Mora-Sero, S. Mhaisalkar, X. Zheng, L. Sun, J. Moon, S. Hayase, H. Han. After the SISF2018, efficiency of perovskite solar cell was announced to reach 23.3%.

In the 8th SISF in 2019 (June 19-21), more physics on halide perovskite will be discussed to better understand high efficiency perovskite photovoltaics and related issues. In addition, improved external quantum efficiency of perovskite LED will be discussed in this forum. Latest technologies toward theoretical efficiency of perovskite photovoltaics will be delivered in the SISF2019. Our team will do our best to contribute to photovoltaic world and international collaboration via SISF.

Organizing Committee

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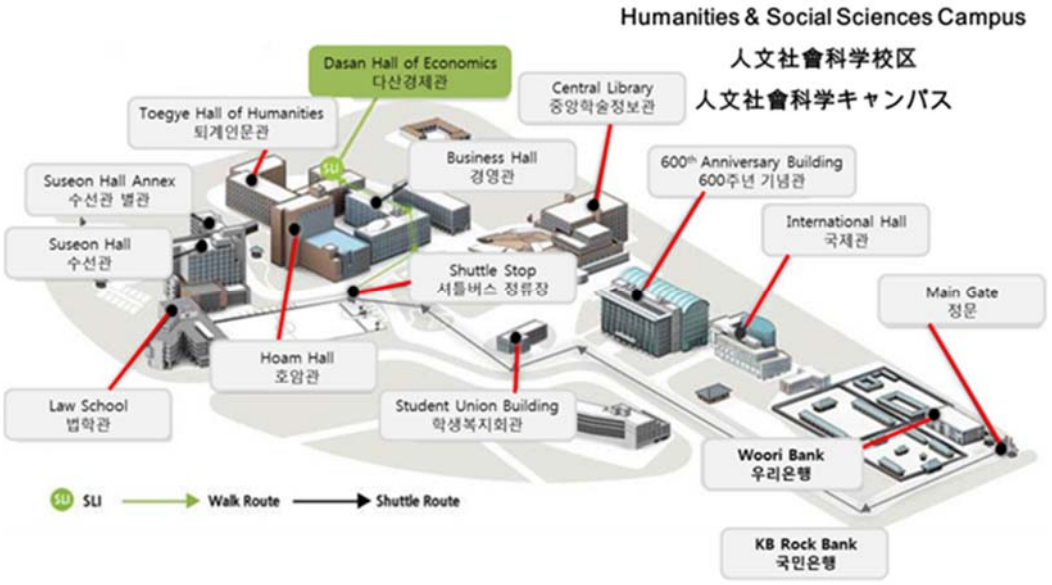
Venue

600th Anniversary Hall
Sungkyunkwan University, Humanities and Social Science Campus, Seoul, Korea
(www.skku.edu)



✈Ways to Get From Incheon Airport to the Campus

From Incheon Int'l Airport

By subway

A. Take the Airport Railroad from Incheon Airport. There is a commuter line and express line. It will be better for you to take express line if you can.
B. Transfer to line 1 at the Seoul station. You should take the subway in the direction of City Hall station and Jonggak station, not Yongsan station and Singil station.
C. Transfer to line 4 at the Dongdaemun Station. Take the subway toward Hyehwa station.
D. Get off the train at Hyehwa station. Exit the station out of exit number 1 and walk straight. There will be university shuttle bus.
E. Take the shuttle bus you will be arrived in Seoul campus of Sungkyunkwan University.
Fares : 3,800KRW(subway) + 300KRW(shuttle bus) = 4100KRW
Time : 103 minutes
More information about subway in Seoul : http://www.seoulmetro.co.kr/

By bus

A. Walk to the bus stop in the Incheon Airport.
B. Buy ticket for, and take bus number 6011.
C. Get off the bus at the SungDae Ipgu. It may also say HyeHwa station, it is the same stop.
D. Walk to Sungkyunkwan University main gate or take a university shuttle bus from in front of Daiso.
Fair : 10,000KRW(bus) + 300KRW(shuttle bus)

List of Invited Speakers (confirmed)

I-1 (psc) Michael Grätzel (EPFL, Switzerland)

I-2 (theory) Jao van de Lagemmat (NREL, USA)

I-3 (physics) Laura Herz (Oxford University, UK)

I-4 (psc) Prashant Kamat (Notre Dame Univ., USA)

I-5 (opv) Byungha Shin (KAIST, Korea)

I-6 (psc) Atsushi Wakamiya (Kyoto Univ., Japan)

I-7 (psc) Lioz Etgar (Hebrew University of Jerusalem, Israel)

I-8 (EIS) Juan Bisquert (Universitat Jaume I, Spain)

I-9 (psc) Tom Miyasaka (Toin Univ., Japan)

I-10 (theory) Yanfa Yan (University of Toledo)

I-11 (psc) Annamaria Petrozza (IIT, Itlay)

I-12 (psc) Henry Snaith (Oxford University, UK)

I-13 (highest PCE) Jingbi You (Institute of Semiconductors, CAS)

I-14 (pled) Maksym Kovalenko (ETH, Switzerland)

I-15 (pled) Taewoo Lee (SNU, Korea)

I-16 (semicond mater.) Jeewhan Kim (MIT, USA)

I-17 (Nature Energy Editor) Nicky Dean (Nature Energy, England)

I-18 (psc) Anders Hagfeldt (EPFL, Switzerland)

I-19 (psc tandem) Michael D. McGehee (U. Colorado, USA)

I-20 (psc) Hiroshi Segawa (The University of Tokyo, Japan)

I-21 (psc) Michael Saliba (Fribourg University, Switzerland)

I-22 (theory) Filippo De Angelis (CNR-ISTM, Italy)

I-23 (psc) Yabing Qi (OIST, Japan)

I-24 (hydrogen) Ki Tae Nam (SNU, Korea)

I-25 (htm psc) Licheng Sun (KTH Royal Institute of Technology, Sweden)

I-26 (non Pb psc) Shuzi Hayase (KIT, Japan)

I-27 (psc) Jong Hyeok Park (Yonsei University, Korea)

I-28 (ald psc) Hyunjung Shin (SKKU, Korea)

I-29 (psc and pled) Subodh Mhaisalkar (NTU, Singapore)

I-30 (psc) Seigo Ito (Hyogo Univ., Japan)

Biography

Invited Speakers (I)

I-1. Michael Grätzel (EPFL, Switzerland)

Michael Gräetzel, Ph.D. is a Professor at the Ecole Polytechnique Fédérale de Lausanne where he directs the Laboratory of photonics and interfaces. He pioneered investigations of electron transfer reactions in mesoscopic systems and their application for electricity and fuel generation from sunlight. He invented the dye-sensitized solar cell (DSSC) that engendered perovskite photovoltaics one of the most exciting break-troughs in the history of photovoltaics. The DSSC is meanwhile commercially produced at the multi-Megawatt scale. His recent awards include the Global Energy Prize, Millenium Technology Prize, Balzan Prize, King Faisal International Science Prize, Einstein World Award of Science and 10 honorary doctor's degrees. He presented close to 100 named lectures and published some 1400 peer-reviewed articles that received over 200,000 citations (h-factor =210, by ISI-Web of Science) as well as several books. He serves on the editorial board of 12 peer-reviewed journals. He is an elected member (fellow) of the Royal Chemical Society, the German and Bulgarian Academies of Science and Royal Spanish Academy of Engineering.

I-2. Jao van de Lagemmat (NREL,. USA)

Jao van de Lagemaat directs the Chemistry and Nanoscience Center at NREL. He received his PhD in 1998 from the University of Utrecht. From 1998 to 2001, he worked as a postdoctoral researcher at NREL on charge transport and recombination in dye-sensitized solar cells. His papers in this field have proven seminal to the understanding of this unique system. From 2001 to the present, he has worked as a scientist at NREL. He is currently researching plasmon/exciton interactions in individual quantum dots, interfacial and ultrafast phenomena in perovskite semiconductors, and solar fuel forming systems. Dr. van de Lagemaat is also a fellow of the Renewable and Sustainable Energy and the Materials Science and Engineering Program, and a lecturer in the Department of Physics at University of Colorado at Boulder.

I-3. Laura Herz (Oxford University, UK)

Laura Herz is a Professor of Physics at the University of Oxford where she directs the Semiconductors Group at the Clarendon Laboratory. She received her PhD in Physics from the University of Cambridge in 2002 and was a Research Fellow at St John's College Cambridge from 2001 – 2003, after which she moved to a faculty position at Oxford Physics. Professor Herz has published more than 150 peer-reviewed research articles (20000 citations, h-index 55 – Google Scholar 2018) and is currently listed by Clarivate Analytics/Web of Science as a Highly Cited Researcher. Her research interests lie in the area of organic, inorganic and hybrid semiconductors, including aspects such as photophysical and nano-scale effects, self-assembly, charge-carrier dynamics, energy-transfer and light-harvesting for solar energy conversion. Recently, she was awarded the Nevill Mott Medal and Prize by the Institute of Physics and the Friedrich-Wilhelm-Bessel Award of the Alexander von Humboldt Foundation. She is an Associate Editor of Applied Physics Reviews (AIP) and a member of the editorial advisory board for ACS Energy Letters. Prof Herz is a Fellow of the Royal Society of Chemistry, the Institute of Physics, and University College Oxford.

I-4. Prashant Kamat (Notre Dame Univ., USA)

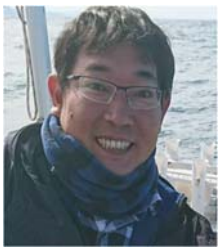
Prashant V. Kamat is a Rev. John A. Zahm, C.S.C., Professor of Science in the Department of Chemistry and Biochemistry and Radiation Laboratory at the University of Notre Dame. He is also a Concurrent Professor in the Department of Chemical and Biomolecular Engineering. He earned his doctoral degree (1979) in Physical Chemistry from the Bombay University, and postdoctoral research at Boston University (1979-1981) and University of Texas at Austin (1981-1983). He joined Notre Dame in 1983. Professor Kamat has for more than three decades worked to build bridges between physical chemistry and material science to develop advanced nanomaterials that promise cleaner and more efficient light energy conversion. He has published more than 450 scientific papers that have been well recognized by the scientific community (57000+ citations, h-index 125 –Source Web of Science). Thomson-Reuters has featured him as one of the most cited researchers in 2014, 2016 and 2017.
He is currently serving as the Editor-in-Chief of ACS Energy Letters. He has also served as the deputy editor of the Journal of Physical Chemistry Letters. He is a member of the advisory board of several scientific journals (Chemical Reviews,

Journal of Colloid & Interface Science, ACS Applied Nanomaterials, and Applied Electrochemistry). He was awarded Honda-Fujishima Lectureship award by the Japanese Photochemical Society in 2006, CRSI medal by the Chemical Research Society of India in 2011 and Langmuir lectureship award in 2013. He is a Fellow of the Electrochemical Society (ECS), American Chemical Society (ACS) American Association for the Advancement of Science (AAAS) and Pravasi Fellow of the Indian National Science Academy.

I-5. Byungha Shin (KAIST, Korea)

To be announced

I-6. Atsushi Wakamiya (Kyoto Univ., Japan)



Atsushi Wakamiya is an associate professor in Kyoto University. He received his BS, MS, and PhD degrees in physical organic chemistry from Kyoto University, in 1998, 2000, and 2003, respectively. During the summer of 2000, he worked with Prof. Lawrence T. Scott at Boston College (USA) as a visiting researcher. He started his academic carrier at Nagoya University as an Assistant Professor with Prof. Shigehiro Yamaguchi in 2003. In 2010, he moved to Kyoto University. He is a group leader of ALCA project of JST from 2016. He is a co-chair of the 1st Japanese-American-Germany Frontiers of Science Symposium (2017). His research interests include physical organic chemistry, organoboron chemistry, and materials science.

I-7. Lioz Etgar (The Hebrew University of Jerusalem, Israel)

Lioz Etgar obtained his Ph.D. (2009) at the Technion–Israel Institute of Technology and completed post-doctoral research with Prof. Michael Grätzel at EPFL, Switzerland. In his post-doctoral research, he received a Marie Curie Fellowship and won the Wolf Prize for young scientists. Since 2012, he has been a senior lecturer in the Institute of Chemistry at the Hebrew University. On 2017 he received an Associate Professor position. Prof. Etgar was the first to demonstrate the possibility to work with the perovskite as light harvester and hole conductor in the solar cell which result in one of the pioneer publication in this field. Recently Prof. Etgar won the prestigious Krill prize by the Wolf foundation. Etgar's research group focuses on the development of innovative solar cells. Prof. Etgar is researching new excitonic solar cells structures/architectures while designing and controlling the inorganic light harvester structure and properties to improve the photovoltaic parameters.

I-8. Juan Bisquert (Universitat Jaume I, Spain)

Juan Bisquert is a professor of applied physics at Universitat Jaume I de Castelló. He is the director of the Institute of Advanced Materials, that develops research activity on materials, nanostructures and devices for production and efficient use of clean energies. He published 400 papers in research journals, and authored a series of books, including Nanostructured Energy Devices and Physics of Solar Cells: Perovskites, Organics, and Photovoltaics Fundamentals (CRC Press). He has 40000 citations and h-index 90. He is a Senior Editor of the Journal of Physical Chemistry Letters and member of the editorial board of Energy and Environmental Science He has been distinguished list of 3000 Highly Cited Researchers from 2014 to 2018.

The research work is in perovskite solar cells, hybrid solar cells, water splitting with visible light and semiconductors (solar fuel production), and lithium battery. Bisquert's most well known work is about mechanisms governing the operation of nanostructured and solution processed thin film solar cells. He has developed significant insights in the electronic processes in hybrid organic-inorganic solar cells, combining novel theory of semiconductor nanostructures, photoelectrochemistry, and systematic experimental demonstration. His contributions produced a broad range of concepts and characterization methods to analyze the operation of photovoltaic and optoelectronic

devices in general, in a highly interdisciplinary strategy. The research interests also include related systems such as organic LEDs, and bioelectronics/biofuels.

I-9. Tom Miyasaka (Toin Univ., Japan)

Tsutomu (Tom) Miyasaka received his Doctor of Engineering from The University of Tokyo in 1981. In 2001, after 20 year R&D work at Fuji Photo Film, Co., he moved to Toin University of Yokohama (TUY), Japan, as professor in Graduate School of Engineering, where he served as the dean of Graduate School (2006–2009). In 2004 he has established a TUY-based company, Peccell Technologies, serving as CEO. In 2005 to 2010 he also served as a guest professor at The University of Tokyo. Currently he is a professor of TUY and a fellow of Research Center for Advanced Science and Technology (RCAST) of The University of Tokyo. His research has been focused on the study ofo light to electric energy conversion involving photochemical processes by enhancing rectified charge transfer at photo-functional interfaces of semiconductor electrodes. He has contributed to the design of low-temperature solution-printing process for fabrication of dye-sensitized solar cells and solid-state hybrid photovoltaic (PV) cells. Since the discovery of the organic inorganic hybrid perovskite as PV material in 2006 and fabrication of high efficiency PV device in 2012, his research has been focued on R&Ds of the halide perovskite PV device. He was awarded a Ministry of Science & Education prize in 2009 on his green sustainable solar cell technology. In 2017 he received Chemical Society of Japan (CSJ) Award and Clarivate (Thomson Reuter) Citation Laureate in 2017 on his research of perovskite photovoltaics. He is presently directing national research projects funded by Japan Science and Technology Agency (JST) and Japan Aerospace Exploration Agency (JAXA).

I-10. Yanfa Yan (University of Toledo, Spain)

Yanfa Yan is a Professor and an Ohio Research Scholar Endowed Chair for Photovoltaics Innovation and Commercialization in the Department of Physics and Astronomy at the University of Toledo (UT). He earned MS and Ph D in Physics from Wuhan University. Previously, he was a Principal Scientist at the National Renewable Energy Laboratory (NREL), USA. His research interest includes (1) Theory of defect physics and electronic properties in semiconductors; (2) Materials synthesis and thin film solar cell fabrication; and Nanoscale characterization of thin film solar cell materials. His current research efforts include developing processes to fabricate high efficiency thin-film solar cells (CdTe and perovskite). He has received DOE/EERE Young Investigator and R&D 100 awards. He is a Fellow of the American Physical Society.

I-11. Annamaria Petrozza (IIT, Italy)

Annamaria Petrozza was born in Matera (Italy) in 1979. She was awarded a Master of Science in Electronic Engineering (emphasis on Devices, design and modelling) at Ecole Supèrieure d'Electricité (Paris, France) in 2003 under the T.I.M.E. (Top Industrial Manager in Europe) program. In 2004 she got a Master degree in Electronic Engineering (emphasis on Optoelectronics) at Politecnico of Milan with a thesis carried out at the Cavendish Laboratory of the University of Cambridge (UK) on the optical characterisation of a class of organic semiconductors with a supramolecular architecture for Organic Light Emitting Diodes. The research work was under the supervision of Prof. C. Cacialli and Prof. C. Silva. In 2008 she received her PhD in Physics from the University of Cambridge (UK) with a thesis on the study of optoelectronic processes at organic and hybrid semiconductors interfaces under the supervision of Dr. J.S. Kim and Prof Sir R.H. Friend. From July 2008 to December 2009 she worked as research scientist at the Sharp Laboratories of Europe, Ltd on the development of new market competitive solar cell technologies (Dye Sensitized Solar cells/Colloidal Quantum Dots Sensitized Solar cells). Her main tasks were to establish key needs of PV market, write research proposals to submit to the Sharp Business Group, and design and implement experiments. Since January 2010 she has a Team Leader position at the Center for Nano Science and Technology -IIT@POLIMI. She is in charge of the development of photovoltaic devices and their characterization by time-resolved and cw Photoinduced Absorption Spectroscopy, Time-resolved Photoluminescence and electrical measurements. Her research work mainly aims to shed light on interfacial optoelectronic mechanisms, which are fundamental for the optimization of operational processes, with the goal of improving device efficiency and stability.

I-12 Henry Snaith (Oxford University, UK)

Henry Snaith was educated at Gresham's School, in Norfolk from 1989 to 1996. He completed his undergraduate studies at the University of Bristol, followed by postgraduate research at the University of Cambridge where he was awarded a PhD in 2005 for research on polymer solar cells supervised by Richard Friend. Following his PhD, Snaith did two years of postdoctoral research with Michael Grätzel at the École Polytechnique Fédérale de Lausanne. He returned to the Cavendish Laboratory as a Junior Research Fellow at Clare College, Cambridge in 2006. Following this, Snaith was appointed a Research Councils UK research fellow while at the University of Oxford, then promoted to Reader and Professor.

I-13. Jingbi You (Institute of Semiconductors, CAS, China)

Prof. Jingbi You got his PhD degree from Institute of Semiconductors, Chinese Academy of Sciences in 2010. And then he worked as postdoc in University of California, Los Angeles, USA. His work mainly in polymer tandem solar cells and perovskite solar cells. In 2015, he moved back to Institute of Semiconductors, Chinese Academy of Sciences as a full professor, and he was also enrolled as Thousand Youth Talents Plan Project in China in 2015. Now his research interests mainly in perovskite optoelectronic devices, including solar cells, light-emitting diodes. He has published over than 80 papers including 10 nature series papers. The total citation of his paper is over than 15000 times.

1-14. Maksym Kovalenko (ETH, Switzerland)

Maksym Kovalenko has been an associate professor (with tenure) of Functional Inorganic Materials since January 2017 and a Head of the Institute of Inorganic Chemistry at ETH Zurich since January 2018. He jointed ETH Zurich in summer 2011 as a tenure-track assistant professor. Previously, he had completed doctoral studies at the University of Linz, (Austria, 2004-2007) and postdoctoral training at the University of Chicago (USA, 2008-2011). The research activities of M. Kovalenko and his group focus on chemistry, physics and applications of inorganic solid-state materials and nanostructures. In particular, present research efforts concern: (i) the precision synthesis of highly luminescent semiconductor nanocrystals; (ii) nanocrystal surface chemistry; (iii) exploration of novel semiconductor materials by solution- and solid-state synthesis; (iv) novel semiconductors for hard radiation detection; (iv) novel materials and concepts for Li-ion and post-Li-ion rechargeable batteries. Many of these activities are strongly linked to industrial partners. Academic collaborations involve various groups ranging from first-principles theory of materials to applications in photovoltaics and thermoelectrics. He is also affiliated with Empa (Swiss Federal Laboratories for Materials Science and Technology). To date, Maksym Kovalenko has published ca. 200 scientific publications in international leading journals, co-authored 3 book chapters, and is listed as an inventor on 11 patents. He has been the recipient of highly prestigious awards including ERC Consolidator Grant (2018), ERC Starting Grant (2012), Ruzicka Preis (2013), and Werner Prize (2016). He also serves as an associate editor of the Chemistry of Materials.

I-15. Tae-Woo Lee (SNU, Korea)

Tae-Woo Lee is a professor in the department of the Materials Science and Engineering at Seoul National University, Korea. He received his Ph.D in chemical engineering from KAIST, Korea in February 2002. Then, he joined Bell Laboratories, USA as a postdoctoral researcher in March 2002. From September 2003 to August 2008, he worked at Samsung Advanced Institute of Technology, Samsung Electronics as a member of research staff. He received a prestigious Korea Young Scientist Award from the President of Korea in 2008 and The Scientist of the Month Award from the ministry of science, ICT and future planning in 2013. He is author and co-author of 192 papers including Science, Nature Photonics, Science Advances, Nature Communications, PNAS, Energy and Environmental Science, Angewandte Chemie, Advanced Materials, and ACS Nano, as well as inventor and co-inventor of 339 patents (187 Korean patents and 188 international patents). His research focuses on organic, organic-inorganic hybrid, and carbon materials and their applications to flexible electronics, printed electronics, displays, solid-state lightings, solar energy conversion devices, and bio-inspired neuromorphic devices.

I-16. Jeewhan Kim (MIT, USA)

Jeehwan Kim received his BS from Hongik University, his MS from Seoul National University, and his PhD from UCLA in 2008, all of them in materials science. Before MIT, Kim has been a research staff member at IBM's T.J. Watson Research Center since 2008, conducting research in photovoltaics, 2D materials, graphene, and advanced CMOS devices. He has been named a Master Inventor at IBM for his prolific creativity, with over 100 patent filings in five years. Kim's breakthrough contributions including: demonstration of peeling of large-area single-crystal graphene grown from a SiC substrate, enabling reuse of the expensive substrate; successful growth of GaN on grapheme, with 25% lattice mismatch and demonstrating that GaN films grown from the process function well as LEDs, pointing to a new principle for growing common semiconductors for flexible electronics; and achieving high efficiency in Si/polymer tandem solar cells and 3D solar cells.

I-17. Nicky Dean (Nature Energy, England)

Nicky Dean is the Chief Editor of *Nature Energy*, which began publishing in January 2016. He joined Nature Research in July 2011 as an editor for *Nature Communications*, where he handled a broad range of manuscripts across applied and fundamental physics and photonics, including solar cells and light-trapping structures for energy harvesting. He was also Team Manager for physics and earth sciences, before leaving to launch *Nature Energy* in April 2015. Prior to becoming an editor, Nicky gained his DPhil from the University of Oxford, where he studied ultrafast dynamics in correlated electron materials using time-resolved spectroscopy. His subsequent postdoctoral studies for the Max Planck Institute for the Structure and Dynamics of Matter involved characterizing and controlling the magnetic behaviour of multiferroics using nonlinear optical techniques.

I-18. Anders Hagfeldt (EPFL, Switzerland)

Anders Hagfeldt is Professor in Physical Chemistry at EPFL, Switzerland. He obtained his Ph.D. at Uppsala University in 1993 and was a post-doc with Prof. Michael Grätzel (1993-1994) at EPFL, Switzerland. His research focuses on the fields of dye-sensitized solar cells, perovskite solar cells and solar fuels. From web of science January 2019, he has published more than 480 scientific papers that have received over 54,000 citations (with an h-index of 114). He was ranked number 46 on a list of the top 100 material scientists of the past decade by Times Higher Education. In 2014-2018 he was on the list of Thomson Reuter's Highly Cited Researchers. He is a member of the European Academy of Sciences, Royal Swedish Academy of Sciences, Stockholm, Royal Society of Sciences in Uppsala, and the Royal Swedish Academy of Engineering Sciences in Stockholm.

I-19. Michael McGehee (U. Colorado, USA)

Mike McGehee is a Professor in the Chemical and Biological Engineering Department at the University of Colorado Boulder. He is also a Fellow of the Materials Science and has a joint appointment at the National Renewable Energy Lab. He was a professor in the Materials Science and Engineering Department at Stanford University for 18 years and a Senior Fellow of the Precourt Institute for Energy. His current research interests are developing new materials for smart windows and solar cells. He has previously done research on polymer lasers, light-emitting diodes and transistors as well as transparent electrodes made from carbon nanotubes and silver nanowires. His group makes materials and devices, performs a wide variety of characterization techniques, models devices and assesses long-term stability. He received his undergraduate degree in physics from Princeton University and his PhD degree in Materials Science from the University of California at Santa Barbara.

I-20. Hiroshi Segawa (The University of Tokyo, Japan)

Hiroshi Segawa is professor of The University of Tokyo, Japan. He received his Ph.D. in Molecular Engineering from Graduate School of Engineering of Kyoto University in 1989 and was Research Associate (1989-1995) at the division of Molecular Engineering of Graduate School of Engineering at Kyoto University. In 1995 he joined the University of Tokyo as Associate Professor of Department of Chemistry at Graduate School of Arts and Sciences. From 1997 he has also been in charge of Department of Applied Chemistry at Graduate School of Engineering. In 2006 Professor Segawa joined Research Center for Advanced Science and Technology (RCAST), The University of Tokyo. From 2016, he was appointed a professor of Department of Multi-Disciplinary Sciences, Graduate School of Arts and Sciences, The University of Tokyo. His research group is focused on the molecular-based solar cells.

I-21. Michael Saliba (Fribourg University, Switzerland)

Michael Saliba is a group leader at the Adolphe Merkle Institute in Fribourg, Switzerland. From 2015-2017, he was a Marie Curie Fellow at EPFL (with a research visit at Stanford University). He studied mathematics and physics at Stuttgart University (BSc) as well as physics at the Max Planck Institute for Solid State Research (MSc, simulation methods for plasmonic oligomers). He completed his PhD at Oxford University in 2014 (with a research visit at Cornell University) working on crystallisation behaviour and plasmonic nanostructures in perovskites. He has an h-index of 34 and published over 80 works in the fields of plasmonics, lasers, LEDs, and perovskite solar cells. In 2016, he was awarded the *Young Scientist Award* of the German University Association. In 2017, he was awarded the *Science Award of the Fraunhofer UMSICHT* institute, the *René Wasserman Award of EPFL*, and the *Postdoctoral Award of the Materials Research Society (MRS)*. He was also named as one of the *World's 35 Innovators Under 35* by the MIT Technology Review for his pioneering discoveries in the field of perovskite solar cells and optoelectronics. In 2018, he was selected as a Member of the Global Young Academy and the Young Academy of Germany.

I-22. Filippo De Angelis (University of Perugia, Italy)

Filippo De Angelis is chair professor of inorganic chemstry at the University of Perugia and associate to the CNR Institute of Molecular Sciences and Technology, in Perugia, Italy. He is the founder and leader of the Computational Laboratory for Hybrid/Organic Photovoltaics. He earned a BS in Chemistry in 1996 and a PhD in Theoretical Inorganic Chemistry in 1999, both from the University of Perugia. He is an expert in the development and application of quantum mechanical methods to the study of hybrid/organic photovoltaics and materials for energy applications. He is Senior Editor of ACS Energy Letters. He is Fellow of the European Academy of Sciences and Highly cited researcher in 2018. He has published >300 papers with > 24000 citations.

I-23. Yabing Qi (OIST, Japan)

Prof. Yabing Qi is Unit Director of Energy Materials and Surface Sciences Unit at Okinawa Institute of Science and Technology Graduate University. He received his B.S., M.Phil., and Ph.D. from Nanjing University, Hong Kong University of Science and Technology, and University of California Berkeley, respectively. His research interests include perovskite solar cells, surface sciences, energy materials, and organic electronics. Prof. Qi has published 100+ peer-refereed papers and is the inventor for 11 patents/patent applications. He has delivered 80+ keynote and invited research presentations at international conferences, technical meetings and universities. Prof. Qi is Guest Editor of perovskites themed issue of Sustainable Energy & Fuels (Royal Society of Chemistry). He is the Recipient of Young Scientist Award (Materials Research Society of Japan). As Symposium Chair, Prof. Qi organized International Symposium on Organic Electronics (Okinawa, Japan; October 3-5, 2012), International Symposium on Functional Materials (Okinawa, Japan; January 25-29, 2016), and International Symposium on Energy Science and Technology (Okinawa, Japan; January 22-26, 2018). As symposium organizer, he organized Symposium AA: Organic Semiconductors—Surface, Interface and Bulk Doping at the 2015 Materials Research Society Fall Meeting & Exhibit (Boston, USA; November 29-December 4, 2015), and four consecutive symposia on perovskite solar cells at the MRS Meeting: Symposium ES3 at the 2016 MRS Fall Meeting (Boston, USA; November 27-December 2, 2016), Symposium ES1 at the 2017 MRS Spring Meeting (Phoenix, USA; April 17 - 21, 2017), Symposium

ES1 at the 2017 MRS Spring Meeting (Boston, USA; November 26 – December 1, 2017), and Symposium EN2 at the 2018 MRS Spring Meeting (Phoenix, USA; April 2 - 6, 2018).

I-24. Ki Tae Nam (SNU, Korea)

Ki Tae Nam is associate professor at Department of Material Science & Engineering, Seoul National University. He received his B.S. and M.S. from Seoul National University in 2000, 2002 and Ph.D., from Massachusetts Institute of Technology in 2007, respectively. He worked at Lawrence Berkeley National Laboratory, USA from 2007 to 2010 as postdoctoral fellow before joining SNU.

He has been doing researches on Bio-mimetic systems, Nano materials, Artificial-photosynthesis and Bio-mineralization. He has received numerous awards including Korean Presidential Young Scientist Award (Ministry of Science and ICT), Top 100 Excellency in National Research and Development Award (Ministry of Science and ICT), Top 10 nanotechnology Award (KoNTRS), 20th Young Scienctist Award (The Korean Institute of Metals and Materials), 21st and 24th Samsung Humantech Paper award (Energy & Environment, Samsung Electronics) and Young Scienctist Award(Environmental Energy Division, The Korean Chemical Society). He published over 100 peer-reviewed scientific papers, including Science, Nature Materials, Nature photonics, Nature Energy and Nature Communications, 51 patent applications, 2 book chapters. He received H-index of 30 as of April, 2018

I-25. Licheng Sun (KTH Royal Institute of Technology, Sweden)

Prof. **Licheng Sun** received his PhD degree in 1990 from Dalian University of Technology (DUT), and went to Germany as a postdoc at Max-Planck-Institut für Strahlenchemie with Dr. Helmut Görner (1992-1993), and then as an Alexander von Humboldt postdoc at Freie Universität Berlin (1993-1995) with Prof. Dr. Harry Kurreck. He moved to KTH, Stockholm in 1995 as a postdoc with Prof. Björn Åkermark, became assistant professor in 1997 at KTH, associate professor in 1999 at Stockholm University and full professor in 2004 at KTH. He is presently also a distinguished professor at DUT, and director of DUT-KTH Joint Education and Research Center on Molecular Devices. His research interests cover artificial photosynthesis (solar fuels), dye sensitized solar cells, perovskite solar cells. He has made outstanding contribution to the design and synthesis of molecular catalysts for water oxidation and deep insight studies on the reaction mechanisms of O-O bond formation. Prof. Sun has published more than 500 peer reviewed papers in well-known international scientific journals including *Science*, *Nature Chemistry*, *Nature Communications*, *Advanced Materials, Angew. Chem. Int. Ed., J. Am. Chem. Soc.* and *Energy Environmental Sci*., with total number of citations >30 000, and H-index of 83 (*Web of Science*). He serves as editorial board chairman of *ChemSusChem*, associate editor of *J. Energy Chemistry*. He is the recipient of Ulla och Stig Holmquist Prize in Organic Chemistry 2013, Arrhenius Medal 2014, Smart Energy Technology Award 2016 from International Association of Advanced Materials, and Wallmark Prize 2016 from the Royal Swedish Academy of Sciences, elected as Member (No. 1775) of the Royal Swedish Academy of Engineering Sciences (IVA) 2017, Thomson Reuters Highly Cited Researcher 2014 and 2017.

I-26. Shuzi Hayase (KIT, Japan)

Shuzi Hayase is professor in Kyushu National Institute of Technology, Japan. He graduated from Osaka University in 1978 and received Ph.D from Osaka University in 1983. He joined R&D Center in Toshiba from 1978 to 2000, during which he was engaged in development of ULSI lithography, solar cells, direct methanol fuel cells, and polysilanes. He joined polysilane research in Robert West group of Wisconsin University (US) from 1988 to 1990. He is a professor of Kyushu Institute of Technology (National Institute) since 2001. From 2009 to 2017, he was a Supervisor of PRESTO project (Japan Science and Technology Agency (JST), "Photoenergy conversion systems and materials for the next generation solar cells" project). From 2012 to 2016, he was Dean of graduate school of life science and systems engineering, Kyushu Institute of Technology. From 2016 to 2018, he was Executive Director, vice-President of Kyushu Institute of Technology. His research interest is printable solar cells and thermoelectric devices. He received the following awards: Kamura award in 2017 on printable solar cells. Award for Technological Development by the Japan Electrical Manufacturers' Association in 1996, about materials for high insulating properties. Chemistry Society of Japan Award for Technological Development: Awarded for distinguished contributions in technological development in chemistry industry in 1992, on Ring opening catalyst for electrical devices. National Commendation for Invention by Japan Institute of Invention and Innovation.in 1987, on Ring-opening catalyst for electrical devices.

I-27. Jong Hyeok Park (Yonsei University, Korea)

To be announced

I-28. Hyunjung Shin (SKKU, Korea)

Hyunjung Shin received his M.S. and Ph.D. in Material Science & Engineering from Case Western Reserve University, USA, in 1994, and 1996, respectively. Before joining department of energy science, Sungkyunkwan University, Suwon, Korea, as a full professor in 2012, he worked at Kookmin University, Seoul, Korea, as professor from 2002 to 2012, and at Samsung Advanced Institute of Technology, Suwon, Korea, as a member of research staff from 1997 to 2002. He performed postdoctoral researches at Max-Planck Institute fur Metallforschung, Stuttgart, Germany from 1996 to 1997 as an Alexander von Humboldt fellow. He has been working on the 1-dimensional nanomaterial synthesis using by ALD, characterization and its energy & environmental applications. He published over 150 papers, including Science Advances, Nature Energy, Nature Nanotechnology, Nano Letters, Journal of the American Chemical Society, Advanced Materials, and Journal of Power Sources. He is currently full professor at department of energy science, Sungkyunkwan University, Suwon, Korea. (EML, http://emlab.skku.edu).

I-29. Subodh Mhaisalkar (NTU, Singapore)

Subodh Mhaisalkar is the Tan Chin Tuan Centennial Professor in the School of Materials Science & Engineering at the Nanyang Technological University (NTU), Singapore. Subodh is also the Associate Vice President Research (Strategy and Partnerships) and the Executive Director of the Energy Research Institute @ NTU (ERI@N), a pan-University multidisciplinary research institute for innovative energy solutions. Prior to joining NTU in 2001, Subodh has over 10 years of research and engineering experience in the microelectronics industry and his areas of expertise and research interests includes semiconductor technology, perovskite solar cells, printed electronics, and energy storage. Subodh received his Bachelors' degree from IIT-Bombay and his MS/Ph.D. degrees from The Ohio State University.

I-30. Seigo Ito (Hyogo Univ., Japan)

Seigo Ito received his Ph.D. from the University of Tokyo (Japan) at 2000, with a thesis that was the first to discuss Grätzel-type dye-sensitized solar cells in Japan. He worked in the Laboratory of Professor Shozo Yanagida (Osaka University, Japan) for two years, and in the Laboratory of Professor Michael Grätzel, at the Swiss federal Institute of Technology (EPFL) in Lausanne as a postdoctoral scientist for over three years, where his efforts focused on the progress of high-efficiency dye-sensitized solar cells. He is currently professor at University of Hyogo from 2007, making new printable cost-effective solar cells, including non-vacuum-processed silicon solar cells and perovskite solar cells. He has published around 100 papers with total citation over 12,000.

SISF 2019 Program Table

	Time	June 19 (Wed)	June 20 (Thu)	June 21 (Fri)
Morning	8:30 - 9:00	Registration	Registration	Registration
	9:00 - 9:30		**T. Miyasaka**	**A. Hagfeldt**
	9:30 - 10:00		**Y. Yan**	**M. McGehee**
	10:00 - 10:30		**A. Petrozza**	**H. Segawa**
	10:30 - 11:00		Coffee Break	Coffee Break
	11:00 - 11:30		**H. Snaith**	**M. Saliba**
	11:30 - 12:00		**J. You**	**F. De Angelis**
Lunch	12:00 - 13:00		Lunch	Lunch
Afternoon	13:00 - 13:30	***Opening Remark***	**M. Kovalenko**	**Y.B. Qi**
	13:30 - 14:00	**M. Gratzel**	**T.-W. Lee**	**K.T. Nam**
	14:00 - 14:30	**J. van de Lagemaat**	**J. Kim**	**L. Sun**
	14:30 - 15:00	**L. Herz**	**N. Dean (Nat. En)**	**S. Hayase**
	15:00 - 15:30	Coffee Break	Excursion	Coffee Break
	15:30 - 16:00	**P. Kamat**		**J. Park**
	16:00 - 16:30	**B. Shin**		**H. Shin**
	16:30 - 17:00	**A. Wakamiya**		**S. Mhaisalkar**
	17:00 - 17:30	**L. Etgar**		**S. Ito**
	17:30 - 18:00	**J. Bisquert**		***Closing Remark***

All Invited Speakers: 30 min (or 25 min) including discussion
(25 min talk and 5 min discussion or 22 min talk and 3 min discussion)

Program (TBD)

June 19(Wed)

13:00-13:30	*Opening Remark*
13:30-15:00	**Presider**
13:30-14:00	(I-1) **M. Graetzel**
14:00-14:30	(I-2) **J. van de Lagemaat**
14:30-15:00	(I-3) **L. Herz**
15:00-15:30	*Coffee Break*
15:30-17:30	**Presider**
15:30-16:00	(I-4) **P. Kamat**
16:00-16:30	(I-5) **B. Shin**
16:30-17:00	(I-6) **A. Wakamiya**
17:00-17:30	(I-7) **L. Etgar**
17:30-18:00	(I-8) **J. Bisquert**

June 20 (Thu)

09:00-10:30	**Presider**
09:00-09:30	(I-9) **T. Miyasaka**
09:30-10:00	(I-10) **Y. Yan**
10:00-10:30	(I-11) **A. Petrozza**
10:30-11:00	*Coffee Break*
11:00-12:00	**Presider**
11:00-11:30	(I-12) **H. Snaith**
11:30-12:00	(I-13) **J. You**
12:00-13:00	*Lunch (Lunch Box)*
13:00-14:30	**Presider**
13:00-13:30	(I-14) **M. Kovalenko**
13:30-14:00	(I-15) **T.-W. Lee**
14:00-14:30	(I-16) **J. Kim**
14:30-15:00	(I-17) **N. Dean (Nat. En)**
15:00-18:00	**Excursion**

June 21 (Fri)

09:00-10:30	**Presider**
09:00-09:30	(I-18) **A. Hagfeldt**
09:30-10:00	(I-19) **M. McGehee**
10:00-10:30	(I-20) **H. Segawa**

10:30-11:00	*Coffee Break*
11:00-12:00	**Presider**
11:00-11:30	(I-21) **M. Saliba**
11:30-12:00	(I-22) **F. De Angelis**
12:00-13:00	*Lunch (Lunch Box)*
13:00-15:00	**Presider**
13:00-13:30	(I-23) **Y.B. Qi**
13:30-14:00	(I-24) **K.T. Nam**
14:00-14:30	(I-25) **L. Sun**
14:30-15:00	(I-26) **S. Hayase**
15:00-15:30	*Coffee Break*
15:30-16:50	**Presider**
15:30-16:00	(I-27) **J. Park**
16:00-16:30	(I-28) **H. Shin**
16:30-17:00	(I-29) **S. Mhaisalkar**
17:00-17:30	(I-30) **S. Ito**
17:30-18:00	*Closing Remark*