C A L L F O R P A P E R S

Materials Challenges in Alternative and Renewable Energy 2017

MCARE 2017

February 20– 24, 2017

LOTTE Hotel, Jeju Island, Korea

Materials Challenges in Alternative and Renewable Energy 2017 (MCARE 2017) is a premium conference on energy challenges from materials perspective, providing a unique opportunity for communication and collaboration essential to propel a multi-disciplinary dialogue on innovative and sustainable solutions in the field of alternative and renewable energy. This cutting-edge conference brings together leading global experts from universities, industry, R&D centers, and government agencies to collaboratively communicate materials technologies. MCARE 2017 will also give best poster awards to selected students and researchers.

Plenary Speakers

- Prof. Steve Zinkle,University of Tennessee, USA
- Prof. Byung Jin Cho, Korea Advanced Institute of Science and Technology, Korea
- Prof. Wolfram Jaegermann, Technische Universität Darmstadt, Germany
- Prof. Nam-Gyu Park, Sungkyunkwan University, Korea

Hosted by:
Korean Institute of Chemical Engineers

KIChE
The Korean Institute of Chemical Engineers

Endorsed by:
The American Ceramic Society

The American Ceramic Society
www.ceramics.org

Abstract Submission
May 1 - October 31, 2016

MCARE 2017
www.mcare2017.org

MCARE 2017

Materials Challenges in Alternative and Renewable Energy

MCARE 2017 will address a variety of materials and technologies that are critically needed for development of state-of-art technologies of alternative and renewable energy. The technical program features plenary, keynote and invited talks, contributed oral and poster presentations for 12 thematically-focused technical symposia.

Symposium 1. Materials for Solar Fuel Production and Applications

Symposium 2. Materials Challenges in Perovskite and Next Generation Solar Cells

Symposium 3. Advanced Materials for Energy Storage

Symposium 4. Thermal-to-Electrical Energy Conversion Materials and Applications

Symposium 5. Spectral Conversion Materials for Energy Applications

Symposium 6. Materials for Ultra Low Energy and Emission Vehicle

Symposium 7. Materials for Self-powered Generators and Devices Applications

Symposium 8. Critical Materials for Energy

Symposium 9. Printing Technologies for Energy Saving and Harvesting Devices

Symposium 10. Materials Challenges in Nuclear Energy

Symposium 11. Advanced Materials & Nanodevices for Sustainable and Eco-Friendly Applications

Symposium 12. Young Scientists Forum on Future Energy Materials and Devices

MCARE 2017 February 20-24, 2017 LOTTE Hotel, Jeju Island, Korea

Abstract Submission: May 1- 0ctober 31, 2016

MCARE 2017 | www.mcare2017.org

MCARE 2017, Jeju, Korea, February 19-23, 2017

Symposium 1. Materials for Solar Fuel Production and Applications

- **Brief description and scope of symposia**

Recently, solar fuel production in an artificial system offers an opportunity for generating renewable transportation fuels to replace fossil resources. Sunlight is used to split water into hydrogen and oxygen, or produce carbon-based fuels from carbon dioxide and water. A central theme of the Symposium 1 will be the recent progress and scientific challenges of integrating the light absorbers and catalysts into subsystems, with the goal of achieving closed photo(electro)chemical cycles, CO_2 reduction (or proton reduction) and H_2O oxidation in the single integrated system.

A solar fuel can be produced when and where sunlight is available, and stored and transported for later usage. Various systems made of engineered materials have been developed to reduce proton to hydrogen or carbon dioxide to carbon-based fuels, including photoelectrochemical (PEC) cell, photocatalytic system, solar cell based method and etc.

This special session will bring experts together from the different fields of state-of-art technologies of solar fuel production, which will foster the scientific exchange.

- **Session topics**
  - Photoelectrochemical (PEC) system for solar fuel production
  - Photocatalytic water splitting
  - Photocatalytic carbon dioxide reduction
  - Solar cell-PEC hybrid system for solar fuel production
  - New catalysts for solar fuel generation

- **List of organizers/co-organizers**

Kijung Yong (POSTECH, Korea)
Email: kyong@postech.ac.kr

Yung-Jung Hsu (National Chiao Tung University, Taiwan)
Email: yhsu@cc.nctu.edu.tw

Wooyul Kim (Sookmyung Women's University)
Email: wkim@sookmyung.ac.kr

- **Points of contact**

Professor Kijung Yong
POSTECH, Korea
Email: kyong@postech.ac.kr

MCARE 2017, Jeju, Korea, February 20-24, 2017

Symposium 2. Materials Challenges in Perovskite and Next Generation Solar Cells

- **Brief description and scope of symposia**

Recently, advanced materials and technologies for perovskite and next-generation solar cells have been exploited to develop economically viable, high-performance solar cells. Organo-metal trihalide perovskites have revolutionized the field of thin film solar cells due to their meteoric rise of power conversion efficiency (PCE) of a record value 22.1%. These materials exhibit salient properties such as strong light absorption from the visible into the near-infrared spectral region, long carrier diffusion length, and tailorable optoelectronic properties through compositional engineering of halides and cations. These properties are subservient to the formation and nature of the crystals, morphology, and growth. One of the most fantastic features of organo-metal trihalide perovskite is its ability to self-assemble between precursors of solid-solid, vapour-vapour, vapour-solid, co-solution, solid-solution phases into high quality crystalline powder or thin films at near-ambient conditions. Despite the high efficiency and excellent opt-electronic properties the biggest problem of organo-metal trihalide perovskite is stability under heat and light soaking conditions. This symposium will focus on the key issues and phenomena that are at the frontier of understanding and materials development in perovskite solar cells and next generation solar cells, addressing the following topics but not limited to them.

- **Session topics**

• Materials and issues for perovskite solar cells
  - Fundamental understanding of the materials properties using theory and experiments
  - Role of interface interactions
  - Design of alternate stable perovskite
  - Novel charge transporting materials
  - Crystal growth kinetics
  - Device stability issues
• Materials and technologies for quantum-dot sensitized solar cells
• Materials and technologies for organic and bulkheterojunction solar cells
• Materials and technologies for ferroelectric solar cells
• Materials and technologies for CIGS solar cells

- **List of organizers/co-organizers (not confirmed)**

Prof. M. K. Nazeeruddin, EPFL, Switzerland
E-mail: mdkhaja.nazeeruddin@epfl.ch

Prof. Sang Il Seok, KRICT and UNIST, Korea
E-mail: seoki@unist.ac.kr

Prof. Henk Bolink, University of Valencia , Spain
E-mail: henk.bolink@uv.es

Prof. Chun-Guey Wu, National Central University, Taiwan
E-mail: t610002@cc.ncu.edu.tw

Prof. Hyun Suk Jung, Sungkyunkwan University, Korea

E-mail: hsjung1@skku.edu

- **Points of contact**

Professor M. K. Nazeeruddin
EPFL, Switzerland
E-mail: mdkhaja.nazeeruddin@epfl.ch

MCARE 2017, Jeju, Korea, February 20-43, 2017

Symposium 3. "Advanced Materials for Energy Storage"

- **Brief description and scope of symposium**

Batteries are devices that convert chemical energy into electrical energy. There are many types of batteries available, representing a multi-billion dollar industry. The state-of-the-art electrical energy storage systems are not able to meet the requirements for energy-efficient use in transportation, grid and commercial technologies. Battery technology seeks new concepts in materials design to overcome the current limitations of performance and lifetime. More critical insight is required to both in terms of material structures as well as interfacial reactions to produce next-generation electrode materials and battery cells enabling higher energy densities, high power densities and longer cycling abilities. This symposium will explore novel energy storage materials and technologies that are critical in making the current energy storage systems more effective in the future. In addition, we also strongly welcome abstracts on supercapacitors and flexible batteries for self-powering small electronics.

- **Session topics**

Fundamentals, modeling, mechanisms, materials design, screening, electrode architectures, diagnostics and materials characterization and electrode/electrolyte interface characterization of the following systems:

- Lithium batteries
- Sodium batteries
- Magnesium batteries
- Lithium-air batteries
- Lithium-sulfur Batteries
- Redox Flow Batteries
- All-solid-state Batteries
- High Temperature Batteries
- Flexible Batteries
- Supercapacitors

- **List of organizers:**

Palani Balaya, National University of Singapore, Singapore
E-mail: mpepb@nus.edu.sg

Jinwoo Lee, POSTECH, Korea
E-mail: jinwoo03@postech.ac.kr)

Kiyoshi Kanamura, Tokyo Metropolitan University, Japan
E-mail: kanamura@tmu.ac.jp

Arumugam Manthiram, The University of Texas at Austin, USA
E-mail: rmanth@mail.utexas.edu

Dany Carlier-Larregaray, ICMCB-CNRS, Bordeaux, France
E-mail: carlier@icmcb-bordeaux.cnrs.fr

Jang Wook Choi, KAIST, Korea

E-mail: jangwookchoi@kaist.ac.kr

Neeraj Sharma, University of New South Wales, Australia
E-mail: neeraj.sharma@unsw.edu.au

- **Point of Contact:**

Assoc. Prof. Palani Balaya (National University of Singapore, Singapore)
E-mail: mpepb@nus.edu.sg

MCARE 2017, Jeju, Korea, February 19-23, 2017

Symposium 4. Thermal-to-Electrical Energy Conversion Materials and Applications

- **Brief description and scope of symposia**

  The aim of the symposium is to introduce the state-of-the-art thermoelectric materials as well as modules and systems for thermoelectric power generation and cooling and to assemble experts from the different fields to promote co-operations on thermoelectric materials and applications development. Thermoelectric conversion of body heat, waste heat, geothermal, or solar as an energy source is an attractive and environmentally clean way to generate electrical power and thermoelectric cooling has advantages of precise temperature control, fast response time, and multiformity in system size. New era of thermoelectric materials and applications is opening with significant improvement of thermoelectric properties, which is from nano-structures embedded bulk materials, novel fabrication processing, and discovering a new physical phenomenon. In addition, new functionality such as flexibility added to thermoelectric modules so that applications and markets for thermoelectric modules are expanding.

  This symposium invites papers reporting new thermoelectric materials, enhanced thermoelectric properties, and new applications for power generation and cooling. Leading experts and opinion leaders from universities, institutes, and industries will convene to exchange knowledge and ideas related all thermoelectric technologies.

- **Session topics**
  - Novel thermoelectric materials
  - Waste heat recovery
  - Nano materials and nanocomposites
  - Thermoelectric modules
  - Thermoelectric power generation
  - Thermoelectric cooling
  - Thermoelectric thin films
  - Thermoelectric oxides
  - Hybrid thermoelectric system with photovoltaic and so on.
  - Energy harvesting system
  - Processing and engineering of materials

- **List of organizers/co-organizers**

Min-Wook Oh (Hanbat National University, Korea)
Email: mwoh@hanbat.ac.kr

In Chung (Seoul National University, Korea)
Email: inchung@snu.ac.kr

Woochul Kim (Yonsei University)
Email: woochul@yonsei.ac.kr

- **Points of contact**

Professor Min-Wook Oh
Hanbat National University, Korea
Email: mwoh@hanbat.ac.kr

MCARE 2017, Jeju, Korea, February 19-23, 2017

Symposium S5. Spectral Conversion Materials – Design, Synthesis and Application

- **Brief description and scope of symposia:**

  More efficient energy conversion technologies are an essential challenge facing the increasing demand for energy supply. Spectral conversion luminescent materials are potential candidates to increase the efficiency of solar cells as well as other environmentally relevant technologies, such as photocatalysis, solar fuels and artificial photosynthesis, where usually large parts of the solar spectrum do not contribute to the harvesting scheme. Even the most efficient single-junction solar cells present energy losses of ~30% due to thermalization of high-energy photons and ~20% due to transparency of sub-bandgap photons. Downconversion or quantum cutting, luminescent downshifting, and upconversion are alternatives to diminish these losses. Yet, while cutting edge research conducted around the globe led to promising achievements, remaining challenges (such as low quantum efficiency in nanomaterials, weak and/or narrow absorption, and broadband illumination under real sun conditions) have to be addressed in order to take full advantage of spectral conversion materials. In this context, the rational design of suitable optical materials is crucial for energy conversion enhancement, and approaches reach from novel host materials and dopant optimization for upconversion and downconversion materials to innovative hybrid materials, e.g. combing lanthanide-doped materials, QDs, organic dyes, carbon-based structures and photonic concepts.

  It is the scope of this symposium to provide a platform for the presentation and discussion of recent achievements, developments and remaining challenges regarding the design, synthesis and characterization of spectral conversion materials as well as their assembly to more efficient devices. It is the particular aim to foster the exchange between experts from different fields, such as materials design and chemical materials synthesis (e.g., nanostructures, QDs), synthesis of optical micro- and macromaterials, spectral characterization, and device development in order to communicate knowledge and demands between the different communities. Moreover, taking advantage from interdisciplinary approaches and multifunctional materials, experts in synthesis and characterization of spectral conversion materials from related research areas (such as bioprobe, phosphor or laser design) are greatly welcome.

  Topics will focus on, but not been limited to, spectral conversion materials with emphasis on materials design and synthesis, characterization and optimization, assembly of hybrid structures, clarification of mechanisms, device fabrication, and applications in energy (and beyond) technologies.

- **Session topics include:**

  - Materials for upconversion, downconversion / quantum cutting and luminescent downshifting
  - Lanthanides, dyes and quantum confined nanomaterials (quantum dots, wires, plates, etc.) for photovoltaic applications
  - Spectral conversion for photo-catalytic and water-splitting applications
  - Triplet–triplet annihilation photon-upconversion
  - Development of novel optical materials: From nano to macro - Achievements and challenges in the design and synthesis of innovative nano-, micro- and macrostructures including lanthanide-doped materials, QDs, carbon-based materials etc.
  - Smart assemblies: Combining lanthanide-doped nanoparticles, QDs, carbon-based nanostructures, dyes etc. to enhance spectral conversion efficiency.
  - Novel device design: Towards module-scale solar-chemical energy harvesting by implementing e. g., 3D-printed solar concentrators, external light traps, etc.
  - Plasmonic / photonic manipulation of conversion processes

- Novel sustainable and green synthesis approaches for energy conversion materials
- Deeper understanding and prediction of more efficient energy converters: Theoretical approaches and modeling
- Application-oriented approaches in spectral conversion
- Multifunctional spectral conversion materials: Applications beyond the energy sector (e.g., novel phosphor materials, bioprobes, etc.)

- **List of organizers / co-organizers:**

  - Eva Hemmer (University of Ottawa, Canada)
    Email: ehemmer@uottawa.ca

  - Timur Sh. Atabaev (Seoul National University, Korea)
    Email: atabaev@snu.ac.kr

  - Karin Hinzer (University of Ottawa, Canada)
    Email: khinzer@uottawa.ca

  - Stefan Fischer (UC Berkeley, USA)
    Email: sfischer@lbl.gov / sfischer.public@gmail.com

  - Jose Marques-Hueso (Heriot-Watt University, UK)
    Email: J.Marques@hw.ac.uk

  - Jorge Méndez-Ramos (Universidad de La Laguna, Spain)
    Email: jmendezr@ull.es

  - Marta Quintanilla (CICbiomagune, Spain)
    Email: mquintanilla@cicbiomagune.es

- **Point of contact:**

Professor Eva Hemmer
University of Ottawa, Canada
Email: ehemmer@uottawa.ca

MCARE 2017, Jeju, Korea, February 19-23, 2017

Symposium 12. Materials for Super Ultra Low Energy and Emission Vehicle

- **Brief description and scope of symposia**
  This symposium will aim at fundamental understandings and practical development of the exhaust gas purification system for the Super Ultra Low Energy & Emission Vehicle. Due to the modification of engine driving condition to achieve high fuel efficiency and low emission at the same time, the temperature of the exhaust gas decreases undesirably, which results in the decline of the performance of existing purification system. This symposium will deal with the upgraded catalysts and adsorbents to exhibit higher performance at the low temperature, and the mechanism of the sintering and the poisoning of the catalysts for preventing the deactivation of the catalysts and commercializing the purification system.

- **Session topics**
  • Catalysts for oxidation of CO, hydrocarbon, and NO
  • Selective catalytic reduction (SCR) of NO using urea
  • Catalyst for combustion of Particulate Matters (PM)
  • Diesel particulate filter (DPF)
  • Adsorbents of NOx, hydrocarbon
  • Mechanism of catalyst sintering and poisoning
  • Reduction or replacement of precious metals in automobile catalyst
  • Establishment of control model

- **List of organizers/co-organizers**

  Kwan-Young Lee (Korea University, Korea)
  Email: kylee@korea.ac.kr

  Do Heui Kim (Seoul National University, Korea)
  Email: dohkim@snu.ac.kr

  Sung June Cho (Chonnam National University, Korea)
  Email: sjcho@chonnam.ac.kr

  International co-organizers will be determined shortly.

- **Points of contact**
  Professor Do Heui Kim
  Seoul National University, Korea
  Email: dohkim@snu.ac.kr

MCARE 2017, Jeju, Korea, February 20-24, 2017

Symposium 7. Materials for Self-power Generators and Devices Applications

- **Brief description and scope of symposia:**
  This symposium will aim at fundamental understandings and practical development of the mechanical/ thermal energy-harvesting strategies, micro/nanometer-scale piezoelectric/triboelectric/thermoelectric effect, and the coupling between piezoelectric/triboelectric potential and semiconductor behavior and functionalities. In addition, we also strongly welcome studies on future energy storage devices and systems including supercapacitors and batteries with a flexible, stretchable platform for self-powering small electronics. Abstracts on the theoretical and experimental study of piezoelectric, ferroelectric, triboelectric and thermoelectric nanomaterial development; nanomaterials for flexible, stretchable supercapacitors and batteries; systematic design and optimization of nanogenerators for self-powered electronics; and coupling effect between piezoelectric or ferroelectric polarization and semiconducting properties including electronic band structure, optoelectronics, photovoltaics, thermoelectrics, catalysts, photoelectrochemistry, etc are greatly welcome.

- **Session topics :**
  • Materials and Devices for Piezoelectric, Triboelectric, Thermoelectric Power Generators
  • Piezoelectric and ferroelectric nanomaterial synthesis, characterization, and integration
  • Flexible, stretchable supercapacitors, batteries, and other energy storage devices
  • Nanomaterials for flexible, stretchable energy storage devices
  • Theoretical and experimental study on nanoscale mechanical/thermal-to-electric energy conversion process
  • Fundamental study on band-structure engineering based on piezoelectric or ferroelectric polarization
  • Hybrid energy-harvesting techniques (mechanical, thermal, solar, etc.)
  • Power management systems for self-powering small electronics

- **List of organizers/co-organizers :**

Sang-Woo Kim (Sungkyunkwan University, Korea)
E-mail: kimsw1@skku.edu

Christian Falconi (Univ. of Rome Tor Vergata, Italy)
E-mail: falconi@eln.uniroma2.it

Husam N. Alshareef (King Abdullah University of Science & Technology, Kingdom of Saudi Arabia)
E-mail: husam.alshareef@kaust.edu.sa

Caofeng Pan (Beijing Institute of Nanoenergy and Nanosystems, China)
E-mail: cfpan@binn.cas.cn

Jeong Min Baik (Ulsan National Institute of Science and Technology, Korea)
E-mail: jbaik@unist.ac.kr

- **Points of contact:**
Professor Sang-Woo Kim (Sungkyunkwan University, Korea)
E-mail: kimsw1@skku.edu

Symposium 8. Critical Materials for Energy

- **Brief description and scope of symposia:**

Focus of this symposium is critical materials for energy applications. Critical materials constitute rare metals and rare earth elements. Known as the "Vitamins of industry", critical materials are increasingly becoming critical resource since global demand for advanced and compact electronic instruments, defense equipment, magnets, and pollution control catalysts is increasing every day. In these days, critical materials become a hot issue due to its core role to the main element as well as its rarity. Since the rarity is not only determined by its existence in nature, but also the balance between demand and supply; assurance has been propelled in various manners such as exploration, recycling, substitution etc. This symposium will bring experts together to exchange ideas, and experiences on critical materials, which will foster the scientific exchange.

- **Proposed Session Topics:**

  • Rare earth elements

  • Critical materials strategies and industry

  • Exploration and mining

  • Extraction, refining and materialization technologies

  • Recycling and substitution technology

  • Optical, photonic, electronic, magnetic and energy application.

- **Symposium Organizers:**

Taek-Soo Kim, Korea Institute of Industrial Technology, Korea University of Science and Technology, Korea

Ryan Ott, Ames Laboratory, USA

Tadachika Nakayama, Nagaoka University, Japan

Annett Gebert, Leibniz Institute for Solid State and Materials Research, Germany

Bum Sung Kim, Korea Institute for Rare Metals, Korea

Wei-Sheng Chen, National Cheng Kung University, Taiwan

Dudley J. Kingsnorth, Curtin University, Australia

Nobuhito Imanaka, Osaka University, Japan

Lorenzo Martínez Gómez, National Autonomous University of Mexico, Mexico

Soon-Jik Hong (Kongju National University, Korea)

Claudiu C. PAVEL, Institute for Energy and Transport. Energy Technology Policy Outlook Unit. European Commission

Jae-Chun Lee, Korea Institute of Geoscience and Mineral Resources (KIGAM)

Lee Jong-Hyeon, Chungnam National University, Korea

- **Point of contact:**

Dr. Taek-Soo Kim
Korea Institute of Industrial Technology, Korea University of Science and Technology
E-mail: tskim@kitech.re.kr

MCARE 2017, Jeju, Korea, February 20-24, 2017

Symposium 9. Printing Technologies for energy Saving and Harvesting Devices

- **Brief description and scope of symposium:**

The Printed Electronics market is getting bigger every year because of huge demand for renovation and cost reduction in industrial manufacturing process. In order to meet this soaring global demand, many research activities are being carried out and new development of printing methods are introduced. In recent years, the user of Portable devices such as Smart phones, Tablet PC, Fitbit band is increased and demand for Smart devices with Wearable and Flexible form is increasing. Accordingly, the demand for innovation and low-cost manufacturing process in the area of Energy Saving and Harvesting is growing which utilizes printing process technologies. In these various printing processes, many scientific and technical issues have to be resolved for smart applications for high-efficient and cost-effective manufacturing of energy saving and harvesting components. This symposium will bring experts together from the different fields of state-of-art technologies of Printed and Flexible Energy Devices, which will foster the scientific exchange. This symposium will welcome contributed papers related to the following topics (but not limited to):

- **Session topics:**

- Energy saving and harvesting Materials for Printing Technology

  - Materials for Printed Solar cell
  - Materials for Printed battery Applications
  - Materials for Energy Harvesting Devices
  - Inorganic and hybrid Materials for Printed Energy Device applications

- Printing Process and Devices
  - Device Fabrication process for Printed Energy devices
  - Characterization and Evaluation methods for Printed Energy devices
  - Equipments for Printing of Energy devices

- **Symposium Organizers:**

Ju Hwan Choi (Korea Electronics Technology Institute, Korea)
Email: netside@keti.re.kr

MCARE 2017, Jeju, Korea, February 20-24, 2017

Symposium 10. Materials Challenges in Nuclear Energy

• Brief description and scope of symposium:
Nuclear energy has the potential to become an innovative energy source once again when solutions are found to overcome severe accident potential and the waste issue for the current fleet power plants. This symposium will focus on improved and advanced materials for alternative reactor concepts, core structures, and fuels that enable the innovative nuclear power. With the advent of new reactor concepts, there is a significant challenge for development of advanced materials to meet the stringent requirements. Thus, a systematic approach of modeling, processing, characterization, and in-service performance testing is required to bring new materials in use. This symposium will provide a forum for the global experts in diverse areas of materials for nuclear energy to discuss recent progress in the field.

- **Topics for the symposium are:**
  - Modeling and simulations of structural materials
  - High temperature and high performance of emerging metals and alloys
  - Advanced ceramics and composites
  - Material performance in radiation environments
  - Degradation mechanisms and lifetime predictions of material components
  - Material behavior in severe (loss of coolant, LOC, accident) environments
  - Characterization of materials and non-destructive evaluations
  - Heat transfer materials and coolants
  - Materials for radioactive waste containment and disposal

- **List of organizers/co-organizers:**

Hua-Tay Lin (Guangdong University of Technology, China)
E-mail: huataylin@gdut.edu.cn

Changheui Jang (Korea Advanced Institute of Science and Technology, Korea)
E-mail: chjang04@kaist.ac.kr

Yutai Katoh (Oak Ridge National Laboratory, USA)
E-mail: katohy@ornl.gov

Hisayuki Suematsu (Nagaoka University of Technology, Japan)
E-mail: suematsu@nagaokaut.ac.jp

Ji-Jung Kai (City University of Hong Kong)
E-mail: jjkai@cityu.edu.hk

Guo-jun Zhang (Donghua University, China)
E-mail: gjzhang@dhu.edu.cn

• Points of contacts:

Professor Hua-Tay Lin (Guangdong University of Technology, China)
E-mail: huataylin@gdut.edu.cn

Professor Changheui Jang (Korea Advanced Institute of Science and Technology, Korea)
E-mail: chjang04@kaist.ac.kr

MCARE 2017, Jeju, Korea, February 20-24, 2017

Symposium 11: Advanced Materials and Nanodevices for Sustainable and Eco-Friendly Applications

- **Brief description and scope of symposia:**
  This symposium will focus on the development of new advanced materials, combinations of hybrid nano-materials, low dimensional materials as well as nano-scale devices that focuses on utilizing these designer materials in the development of a sustainable future in an environmentally friendly manner. Studies on the physical properties of advanced materials such as hybrid organic-inorganics as well as nanostructures of inorganic perovskites, composites incorporating novel organic and inorganic systems, polymers, nano-structured materials will be of particular interest. The organizers welcome both theoretical and experimental studies carried out on such materials and device platforms. Under nanoscale devices, studies related to energy harvesting in areas such as photovoltaics, piezoelectricity, triboelectricity and thermoelectricity as well as studies on nano-bio devices are welcome. The organizers also welcome studies related to energy storage and sensing, including integrated system platforms suitable for the field of IOT, including autonomous sensing. Both theoretical and experimental studies are welcome for this symposium.

- **Session topics** are:

  - Fundamental studies on advanced nanoscale materials for energy harvesting and storage
  - Nanoscale triboelectric, piezoelectric, thermoelectric energy harvesting devices.
  - Organic and hybrid materials systems for photovoltaics
  - Photovoltaics based on hybrid and inorganic perovskite materials
  - Novel materials and nanoscale sensor devices for wearable healthcare applications.
  - Energy storage: new materials and devices
  - Metal oxides: fundamental studies and applications.
  - Integrated systems and IOT platforms: incorporation of new technologies into existing technologies and studies on combined sensors, energy harvesting and storage systems.

- **List of organizers/co-organizers:**

  S. Ravi P. Silva (University of Surrey, United Kingdom)
  E-mail: s.silva@surrey.ac.uk

  Yeonho Im (Chonbuk National University, Republic of Korea)
  E-mail: yeonhoim@chonbuk.ac.kr

  Shuit-Tong Lee (Soochow University, China)
  E-mail: apannale@suda.edu.cn

  Rod Ruoff (Ulsan National Institute for Science and Technology, Republic of Korea)
  E-mail: ruofflab@gmail.com

  Ahmed Busnaina (Northeastern University, Boston, United States of America)
  E-mail: busnaina@coe.neu.edu

- **Point of contact:**

  S. Ravi P. Silva (University of Surrey, United Kingdom)
  E-mail: s.silva@surrey.ac.uk

  Yeonho Im (Chonbuk National University, Republic of Korea)
  E-mail: yeonhoim@chonbuk.ac.kr

MCARE 2017, Jeju, Korea, February 19-23, 2017

Symposium 12. Young Scientists Forum on Future Energy Materials and Devices

- **Brief description and scope of symposia**

  The energy materials and devices research area addresses one of the most pressing challenges of our time: securing a stable base for energy supply. These challenges can be met by materials development approaches from various angles: no single approach is likely to suffice and an effective solution will require creative integration of several approaches including photovoltaics, photocatalysis, and hydrogen, as well as energy storage. Young scientists across the world are at the forefront of these activities and have potential to be leaders in their fields in the future. This symposium highlights significant contributions from early-career scholars and scientists on the problem of energy materials and devices. Contributed papers and presentations on the following topics will be primarily considered:

- **Session topics**
  - High efficiency energy harvesting devices
  - High efficiency optoelectronic devices

- **List of organizers/co-organizers**

Doh C. Lee (KAIST, Korea)
Email: dclee@kaist.edu

Woo-Jae Kim (Gachon University, Korea)
Email: wjkim@gachon.ac.kr

Donghyun Lee (Chung-Ang University)
Email: dhlee@cau.ac.kr

- **Point of contact**

Doh Chang Lee
KAIST, Korea
Email: dclee@kaist.edu