International Workshop on Phase Interfaces for Highly Efficient Energy Utilization
-For dramatic advancement in energy utilization efficiency-

Schedule: 8:45-15:15, October 6, 2017 (Friday) International workshop
* 19:00-21:00, October 5, 2017, (Thursday) Dinner

Venue: Gaylord National Resort & Convention Center (MD., Greater Washington D.C.)
Meeting room: Magnolia 1 (located at "Convention Center Ballroom level")

Purposes:

Dramatic advancement in energy utilization efficiency is essential for realizing a prosperous and sustainable society. It is necessary to convert energy through various phase interfaces, and to transport energy in the process of energy utilization. Therefore, elucidation of the mechanisms of conversion and transport of energy and optimization of the process is essential.

Hence, JST established research areas related to "Phase Interface Science" in 2011, and adopted the research themes of CREST (13 themes) and PRESTO (32 themes). It conducts research with the aim of realizing breakthroughs in phase-interface phenomena that will result in a dramatic advancement in high-efficiency energy usage and the creation of basic technologies for high-functionality interfaces.

This research area has yielded several achievements in terms of the elucidation, control, and optimization of mechanisms of energy conversion and transport involving phase interfaces. In the field of electrochemistry, in particular, integrated analyses and designing of porous materials were performed beyond the scales of the material and device. This is a state-of-the-art approach in the world. However, to realize practical application and substantial contribution of these research results to energy utilization, a broader range of subject phenomena needs to be studied and the scale has to be expanded to fill the gaps between studies. We believe that for further development, this research area needs an international network involving related researchers.

Therefore, we have decided to take advantage of the 232nd Biannual Meeting of Electrochemical Society (ECS) of the US, where researchers from the field of electrochemistry worldwide gather. We will conduct discussion sessions, where the local and international researchers can engage in the activities listed below to gain a mutual understanding of their research and technologies and can have discussions that may lead to future collaboration.

1. Researchers present research achievements, conduct discussions, and collect information at the Biannual Meeting of ECS (232nd Biannual Meeting).
2. Local and international researchers from this research area get together, present research achievements, and have discussions to search for ways for new collaboration and joint research.

The purpose of the International Workshop is that researchers who attend the workshop jointly lead the creation of the base science and technology that can lead to dramatic advancement of energy utilization efficiency and can make remarkable contributions to the solution of energy problems.

Host organization:

Japan Science and Technology Agency (JST)
CREST "Phase interface science for high-efficiency energy utilization" research
PRESTO "High-efficiency energy utilization and phase interface" research
Research supervisor: Prof. Katsunori Hanamura

Planning Committee:

Chairman: Prof. Katsunori Hanamura (Tokyo Institute of Technology)

Committee members:

Prof. Takeshi Abe (Kyoto University) Prof. Takuto Araki (Yokohama National University)

Prof. Gen Inoue (Kyushu University) Prof. Michihisa Koyama (Kyushu University)

Prof. Keisuke Nagato (The University of Tokyo) Prof. Shohji Tsushima (Osaka University)

Dr. Fumiaki Kawakami (JST)

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8:45-9:00　Scope of the Workshop
Prof. Katsunori Hanamura (Tokyo Institute of Technology)

[Session 1]　Chair: Prof. Kohei Miyazaki (Kyoto University)

9:00- 9:20　Ion transport phenomena inside composite electrode for lithium-ion batteries
Prof. Takeshi Abe (Kyoto University)

10:00-10:20　Probing charge and mass transport phenomena across interfaces and interphases in Li-ion batteries
Dr. Robert Kostecki (US DOE Berkeley Laboratory)

10:20-10:40　Applications of Computational Chemistry to Phase Interfaces in Electrochemical Device
Prof. Michihisa Koyama (Kyushu University)

----------(break)----------

10:50-11:10　Modeling and experimental characterization on Phase Interfaces in Electrochemical Devices
Prof. Yixiang　Shi (Tsinghua University ）

11:10-11:30　Optimization of Vanadium Redox Flow Batteries: An Approach for Fiber Electrodes and Flow Fields
Prof. Shohji Tsushima (Osaka University)

11:30-11:50　Two-Phase Hybrid Regenerative Hydrogen Bromine Fuel Cell for Electrical Energy Storage
Prof. Trung Van Nguyen (The University of Kansas)

11:50-12:10　Incubation time

12:10-13:30　Lunch

[Session 2]　Chair: Prof. Keisuke Nagato (The University of Tokyo)

13:30-13:50　Development of micro sensors for in situ measurement inside PEFC
Prof. Takuto Araki (Yokohama National University)

13:50-14:10　Microscale and nanoscale multiphase transport in polymer electrolyte membrane fuel cells and electrolyzers: modelling and visualizations
Prof. Aimy Bazylak (University of Toronto)

14:10-14:30　"canceled"
Investigation of relationship between electrode structure and cell characteristic by numerical analysis and direct observation
Prof. Gen Inoue (Kyushu University)

14:30-14:50　Engineering electrodes and interfaces for Platinum Group Metal-Free Catalysts for PEMFCs
Prof. Shawn Litster (Carnegie Mellon University)

14:50-15:10　Incubation time

15:10-15:15　Closing Remarks
Prof. Katsunori Hanamura (Tokyo Institute of Technology)

15:15-18:00　Discussion (optional, individually, item by item)

Virtual Institute of Phase Interface Science: http://www.jst.go.jp/crest/soukaimen/EN/index.html
Secretariat: Fumiaki Kawakami　Research Manager, JST　E-mail　fumiaki.kawakami@jst.go.jp

About JST, CREST research, and PRESTO research

What We Are

Japan Science and Technology Agency (JST) is an independent body of the Ministry of Education, Culture, Sports, Science and Technology (MEXT). JST plays a key role in implementing science and technology policies formulated in line with the nation's Science and Technology Basic Plan.

What We Do

With the aim of promoting and encouraging the development of breakthrough technologies that contribute to attainment of the nation's strategic objectives, JST provides a variety of research funding programs for promising research projects. CREST and PRESTO are the JST's major undertakings for stimulating achievement in the fundamental sciences. In addition, ensuring that the achievements of such research benefit the society through innovations is another important responsibility of JST.

What is CREST Research

Based on the nation's science and technology policies and foreseeable social and economic needs in the future, the MEXT defines the priority research objectives called "Strategic objectives" that are expected to have substantial impact on our economy and lives. The strategic objectives also show a path toward the future return of research results to tax payers. CREST (Core Research for Evolutionary Science and Technology) includes team-based projects to create seeds of innovative technology for realizing scientific and technological innovation and for promoting basic research toward attaining the aforementioned strategic objectives.
CREST research is conducted by optimal research teams, each consisting of up to about 20 members from industries, universities, or the government. A research team has a budget of a few hundred million Japanese Yen for an R&D period of five years.

What is PRESTO Research

Like CREST, PRESTO (Precursory Research for Embryonic Science and Technology) aims to promote the fundamental research for strategic objectives that are given strategic focus, as a part of a system that promotes innovations leading to social and economic revolution in addition to generating new innovative technologies that lead to the development of scientific technology and the creation of new industries.
Through PRESTO, under the management of Research Supervisors, JST promotes three to five years of research by individuals, providing a place for exchanges among various institutions and background researchers involved in the same fields of research. A research project has a budget of about 40 million Japanese Yen per researcher for three years.

What is JST Research Area of "Phase Interface Science"

This research area was established in 2011 to aim to create the basic science and technologies, such as the elucidation of phase interface phenomena, related to energy conversion and transport and creation of high-function phase interfaces. The aim is to realize dramatic advancement in energy utilization efficiency toward the realization of a prosperous and sustainable society. CREST promotes 13 team research themes, and PRESTO promotes 32 individual research themes. The works are expected to be completed by the end of March 2019 (a total budget of 6,000 million Japanese Yen).

This research area delves deeper into the basic scientific theories and controlling and optimization technologies for various phase interface phenomena to realize the creation of phase interfaces that can substantially decrease energy loss or the creation of new high-efficiency, high-function phase interfaces for energy utilization. To achieve these purposes, it is necessary to develop the techniques for the integrated analysis and design of phenomena at different scales—nano, meso, and macro scales—and the theoretical techniques for the control

and optimization of phase interface structures. The results of the above-mentioned advanced basic research are effectively applied to actual instruments and systems in order to realize dramatic advancement in performance, decreasing carbon, and reduce costs.

The ultimate objective of this research area are as follows: (1) the creation of high-function phase interfaces for realizing theoretically maximum performance of instruments and devices and the elucidation of energy conversion and transport mechanisms at phase interfaces; (2) development of measurement, remodeling, and simulation technologies for comprehensive analysis and designing of multi-scale phase interface phenomena; and (3) creation of base technologies, such as mathematical and scientific techniques, for the control and optimization of phase interface structures. To achieve the ultimate objectives, a comprehensive approach is adopted to merge scientific knowledge across existing fields and different fields of research.

References:

http://www.jst.go.jp/crest/soukaimen/EN/index.html#3
http://www.jst.go.jp/kisoken/crest/en/research_area/ongoing/areah23-1.html
http://www.jst.go.jp/kisoken/presto/en/research_area/ongoing/101soukaimen.html