

# International Symposium of the Institute of Industrial Nanomaterials (IS-IINa 2023)

*March 7, 2023 (Tuesday)*

*100<sup>th</sup> Anniversary Hall, Kurokami South Campus, Kumamoto University*

Program

## **Opening address**

9:00-9:10 Prof. J. Otani, Vice-President, Kumamoto University

## **Plenary Lecture (1) Chair: Prof. K. Yano**

9:10-10:00 Prof. Julie Gehl, Professor of Clinical Oncology,  
Chief Physician, University of Copenhagen, Denmark

Title: Calcium electroporation; From bench to bedside

*Abstract:* Electroporation based treatments are increasingly used in cancer treatment. Calcium electroporation is a novel evolution where pulsed electric fields permeabilize cell membranes in the presence of calcium, leading to an intracellular calcium overload. This leads to cancer cell death associated with acute and severe ATP depletion. As calcium is already in production for medical use, it was possible to quickly set up the first clinical study; a double blinded randomized clinical study showing similar efficacy to electrochemotherapy (where the cytotoxic agent bleomycin is used). Currently, several studies are published or underway, investigating calcium electroporation for cutaneous tumors, gynecological tumors, head and neck cancer, esophageal and colorectal cancer. Calcium behaves differently than bleomycin both with regards to interaction with the cell membrane, and in terms of intracellular effects. A number of studies are further investigating these phenomena, and may lead to further evolution of the technology. Finally, both preclinical and clinical observations indicate that calcium electroporation may elicit an immune response, with effect beyond the treatment area.

This talk will integrate preclinical and clinical data, and follow the road from initial discovery to clinical implementation.

**Coffee break 10:00 - 10:20**

**Invited Lectures Session (1) Chairs: Profs. S. Katsuki & T. Sakugawa**  
Materials Informatics and Processing, Biomaterials/Bioelectronics

10:20- 10:40 Prof. Kosumi, IINa, Kumamoto University

Title: "Ultrashort Laser Pulses: Material Science and Application to Material Process"

10:40- 11:00 Prof. Lee, IINa, Kumamoto University

Title: "Nano platform for constructing new approaches to cancer treatment"

11:00- 11:20 Prof. Wang, IINa, Kumamoto University

Title: "Influence of Pulsed Electric Fields on Photosynthesis in Lettuce"

11:20- 11:40 Prof. Tanaka, IINa, Kumamoto University

Title: "Sub-micrometer imprinting on large-area foils and plates using high-pressure underwater shock waves"

11:40- 12:00 Dr. Tokuda, IINa, Kumamoto University

Title: "Determination of Cation Distribution Using Synchrotron Radiation: The Case of Transition Metal Sulfides"

**Lunch break      12:00 – 13:00**

**Plenary Lecture (2)** Chair: Prof. S. Hayami

13:00-13:50 Professor Shi-Zhang Qiao, Centre for Materials in Energy and Catalysis, School of Chemical Engineering and Advanced Materials, The University of Adelaide, Australia

Title: Nanostructured Materials for Electrocatalytic Refinery

*Abstract:* Compared to modern fossil fuel-based industrial refineries, the emerging electrocatalytic refinery (e-refinery) is a more sustainable and environmentally benign strategy to convert renewable feedstocks and energy sources to transportable fuels and value-added chemicals. E-refinery promisingly leads to defossilization, decarbonization, and decentralization of chemical industry. Specifically, powered by renewable electricity, oxygen evolution reaction (OER) and hydrogen evolution reaction (HER) can efficiently split water into green hydrogen, CO<sub>2</sub> reduction reaction (CRR) can convert CO<sub>2</sub> emissions to transportable fuels and commodity chemicals, and N<sub>2</sub> reduction reaction (NRR) can potentially manufacture fertilizers at ambient conditions.

In this presentation, I will talk about our recent progress in mechanism understanding and material innovation for a series of crucial electrocatalytic reactions (OER, HER, CRR, NRR, etc.), which are achieved by combining atomic-level material engineering, electrochemical evaluation, theoretical computations, and advanced in situ characterizations. A special emphasis is placed on the rational exploration of novel single-atom catalysts. I will also demonstrate the framework and methodologies of e-refinery with greater complexity by electrocatalytic coupling in situ generated intermediates or products. It will inspire and accelerate further investigations of e-refinery to complement or displace some important industrial processes, and ultimately make the energy and chemical sectors sustainable.

**Coffee break 13:50 - 14:10**

**Invited Lectures Session (2)** Chairs: Profs. S. Ida & M. Kunitake  
Two-Dimensional Nanomaterials

14:10- 14:30 Prof. Yokoi, IINa, Kumamoto University

Title: "Improvement in quantitative evaluation of the properties of graphene oxide"

14:30- 14:50 Dr. Hatakeyama, IINa, Kumamoto University

Title: "Synthesis of Graphene Oxide with Low Defect Density and High Structural Regularity"

14:50- 15:10 Prof. Yoshimoto, IINa, Kumamoto University

Title: "Formation of 2D polycyclic aromatic hydrocarbons at solid–liquid interfaces"

15:10- 15:30 Prof. Koinuma, IINa, Kumamoto University

Title: "Control of Oxygen Functional Groups of Graphene Oxide by Various Reduction Methods"

15:30- 15:50 Dr. Biplab Manna, IINa, Kumamoto University

Title: "Revisiting structural disposition of biomolecule in nanospace"

15:50- 16:10 Dr. Sohail Muhammad Ahmad, IINa, Kumamoto Univ.

Title: "Functionalization of graphene oxide for energy materials and catalytic application"

**Closing remarks**

16:10-16:15 Prof. S. Ida, Director, IINa, Kumamoto University

**Poster Presentation Session of the "IINa Domestic Collaboration Projects"**

16:30-17:30

Session Chair: Prof. K. Hokamoto

(Session organized by Prof. K. Hokamoto)