SEE Tech Talk Series on Advanced Energy Technologies

Time: **9:30AM - 11:45AM**

Date: **7th April 2018 (Saturday)**

Venue: **John Chan Lecture Theatre (LT-11), 4th Floor, Yeung Kin Man Academic Building. City University of Hong Kong, Tat Chee Avenue, Kowloon, Hong Kong**

Organizer:

香港城市大學
City University of Hong Kong

School of Energy and Environment (SEE)

Co-organizers:

energy INSTITUTE HONG KONG

HKAEE 香港能源工程師學會 Hong Kong Association of Energy Engineers

Brief description:

SEE has been undertaking cutting-edge research to address urgent energy- and environment-related issues in three categories: (1) sustainable technologies for energy, environment and health, (2) urban atmospheric and aquatic environment and (3) smart and healthy cities. In this SEE Tech Talk Series, three SEE faculty members will present their ongoing research on advanced energy technologies and potential applications for enhancing energy storage and renewable energy utilization.

Rundown:

9:15-9:30	**Registration**
9:30-9:35	**Opening Remark** Prof. Chak CHAN, Dean, SEE, CityU
	Presentations
9:35-10:05	**Novel Fast Charging Sb Anode for Lithium-ion Battery Applications** Dr. Denis Y.W. YU, Assistant Professor, SEE, CityU
10:05-10:35	**Emerging Renewable Energy Technologies** Dr. Walid Daoud, Associate Professor, SEE, CityU
10:35-10:45	Tea Break
10:45-11:15	**Enhanced Performance and Stability for Hybrid Perovskite Solar Cells for Commercial Applications** Dr. Sam H.Y. HSU, Assistant Professor, SEE, CityU
11:15-11:45	Q&A Session
11:45	End of Event

Note: **Attendance certificates** will be issued to attendees at the end of the event.

Registration: Please click here to sign up or go to http://cap.cityu.edu.hk/postpublic.aspx?id=K10h0420b184402L895928

Enquiry: Please contact Miss Winnie Lo at email: puiyanlo2@cityu.edu.hk or tel: 3442 9693.

Abstracts and speakers:

Novel Fast Charging Sb Anode for Lithium-ion Battery Applications
Dr. Denis Y.W. YU, Assistant Professor, SEE, CityU

Abstract

The lithium-ion battery is one of the most important technologies for energy storage in the market nowadays. With the increasing demand for electric vehicles, batteries with higher capacity and faster charging capability are sought. One of the bottlenecks of existing lithium-ion batteries for fast charging application is the use of graphite as the anode material. Even though graphite can give a capacity of about 350 mAh g^{-1} at a low current rate of 0.1 C, its available charge capacity is much reduced at a higher current rate because its working potential is about 0.1 V vs. Li/Li^+. In addition, lithium plating can easily occur on the surface of the electrode with a high charging current, jeopardizing the safety of the battery.

We have developed a novel Sb anode for lithium-ion battery applications that can be charged at a rate of 20C (within 3 mins) with a reversible capacity of 380 mAh g^{-1}. Volume expansion of the material and electrode during lithiation are controlled by polymer coating and polymer interactions within the electrode. Excellent capacity, rate capability and cycle stability are demonstrated with $Sb/LiFePO_4$ full cells. More details will be shown at the presentation.

About the Speaker

Dr. Denis Yu is an assistant professor at the School of Energy and Environment at City University of Hong Kong. He received his Ph. D. in Applied Physics from the School of Engineering and Applied Sciences at Harvard University in 2003. He then worked as an engineer at SANYO Electric Co. Ltd. in Japan for 8 years, developing cathode and anode materials for Li-ion batteries. Afterwards, he led the battery activities at the Energy Research Institute at Nanyang Technological University and TUM CREATE Centre for Electromobility in Singapore as a senior scientist for two years before joining City University of Hong Kong. His research interests include fabrication, development and characterization of materials and electrodes for energy storage applications.

Emerging Renewable Energy Technologies
Dr. Walid Daoud, Associate Professor, SEE, CityU

Abstract

Development of renewable energies is crucial for meeting future energy needs. Solar, mechanical and kinetics energies can provide sufficient electricity needed in daily life. In this pursuit, solar and kinetic energy harvesting approaches have been developed for energy conversion. While solar self-cleaning technology mainly converts the UV and visible regions of the solar spectrum, kinetic energy of human body movements can be harvested to generate electricity. Being intermittent energy sources, it is equally important to find storage solutions for renewable energy. This seminar intends to present the underlying concepts of the transduction mechanisms and recent research accomplishments. Future prospects and suggestions of the potential application of these technologies in HK will also be discussed.

About the Speaker

Dr. Walid Daoud is an Associate Professor in the School of Energy and Environment, CityU. He graduated from the University of Technology Graz, Austria, with a Dipl-Ing degree (BS and MS) in Chemical Engineering and received his PhD in bilayer photovoltaic

cells from the University of Sheffield, UK. In 2002, he joined the Hong Kong Polytechnic University, where he played a substantial role in the establishment of a Nanotechnology Center in 2003 and took up a lectureship in 2005. In 2007, he moved to Monash University to take up a lecturer post and was promoted to senior lecturer in 2010. Dr Daoud has received international renown and several awards for his pioneering work on solar self-cleaning technology. His research has featured in Nature (2004) and Science (2008) and the international press, such as Reuters (2014), BBC (2015) and SCMP (2017). His current research is mainly focused on the areas of renewable energy conversion and storage and smart textiles.

Enhanced Performance and Stability for Hybrid Perovskite Solar Cells for Commercial Applications

Dr. Sam H.Y. HSU, Assistant Professor, SEE, CityU

Abstract

Hybrid organic-inorganic halide perovskites have been extensively studied due to their remarkable optical and electronic features such as high absorption coefficient, long exciton diffusion length, excellent carrier transport and low exciton binding energy, as well as a facile solution process for the fabrication of organic-inorganic halide perovskites. High-efficiency solar cells with methylammonium lead halide perovskites have been successfully achieved within just a few years. The high quality perovskite films make a significant impact on the fabrication of efficient and stable hybrid perovskite solar cells. Morphology control has been recognized as an effective way to obtain highly crystalline and pinhole-free perovskite films with optimized grain sizes. Thus, I will discuss several methodologies of morphology engineering, such as additive modifications, thermal processes and compositional design. The highly crystallized perovskite layers prepared by using these techniques can show a uniform surface morphology, resulting in enhanced photovoltaic efficiency and long-term stability of hybrid perovskite solar cells.

About the Speaker

Sam H. Y. Hsu's research interests involve the material design, synthesis, processing, imaging, spectroscopy and solar energy application, aiming to explore fundamental properties and interactions of hybrid perovskite semiconductors and functional metallopolymer materials for developing efficient solar energy conversion processes. He has keen interests in photoinduced charge transfer processes, interfacial electron transfer, electrochemical hydrogen generation, and photoredox reactions for photovoltaics and solar fuel production. The investigations between material phenomena rely heavily on concepts and techniques of material and physical engineering, consisting of photophysics, electrochemistry, photoelectrochemistry, scanning photoelectro-chemical microscopy imaging, ultrafast transient absorption and time-resolved photoluminescence spectra.