Faculty Distinguished Lecture

All are Welcome!

Enabling Oxygen Electrocatalysis for Sustainable Energy

Prof. Yang Shao-Horn

Department of Mechanical Engineering
Department of Materials Science and Engineering
Massachusetts Institute of Technology

Host: Faculty of Engineering, The Chinese University of Hong Kong

Date: 16 Jan 2015 (Friday)
Time: 11:45am – 12:45pm
(Tea reception at 11:30am)
Venue: T.Y. Wong Hall, 5/F,
Ho Sin-Hang Engineering Building,
The Chinese University of Hong Kong

Biography

Professor Shao-Horn is the Gail E. Kendall Professor of Mechanical Engineering and Professor of Materials Science and Engineering at the Massachusetts Institute of Technology. Professor Shao-Horn's research programs are centered on understanding the electronic structures of surfaces, with emphasis on metal oxides, searching for descriptors of catalytic activity, surface/interface reactivity and ion transport, and applying fundamental understanding to design materials for oxygen electrocatalysis, CO_2 reduction, ion intercalation and ion conductors, in electrochemical/photoelectrochemical energy conversion and storage, including lithium-ion batteries, flow batteries, metal-air batteries, proton exchange membrane fuel cells and solid oxide fuel cells. Professor Shao-Horn is the recipient of Office of Naval Research Young Investigator Award, the Charles Tobias Young Investigator Award from the Electrochemical Society, the Tajima Prize from the International Society of Electrochemistry and the Research Award by the International Battery Materials Association. Professor Shao-Horn has been elected as AAAS Fellows for 2014.

Abstract

The development of sustainable energy is one of the most important scientific challenges in the 21st century. A critical element for sustainable energy implementation is to have efficient energy conversion and storage. Oxygen electrocatalysis is central to enable photoelectrochemical and electrolytic water-splitting, fuel cells, and metal-air batteries. Probing a fundamental catalyst "design" principle" that links surface structure and chemistry to the catalytic activity can guide the search for highly active catalysts that are cost effective and abundant in nature. While such a design concept exists for metal catalysts, little is known about the design principles for oxygen electrocatalysis on oxides. Recent advances in identifying the design principles and activity descriptors of transition metal oxides will be presented. We will show that these fundamental concepts can be used to tune transition metal oxide surfaces with much enhanced catalytic activities. Moreover, we will discuss how oxide bulk electronic structures can influence the catalytic activities of oxides, from which two different reaction mechanisms are proposed. Lastly, connecting bulk to surface electronic structures is challenging but much needed to provide mechanistic insights, and some in-situ synchrotron X-ray measurements to this end will be discussed.

Enquiry: **Ms. Sylvia Kwok (3943 5519; sylviakwok@erg.cuhk.edu.hk)**
Miss Mandy Tse (3943 8450; mandytse@erg.cuhk.edu.hk)