

# IBN SEMINAR SERIES

## Enabling Oxygen Electrocatalysis for Sustainable Energy

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Science and Engineering, Massachusetts Institute of Technology, USA

Wednesday, November 12, 2014 • 9:00am to 10:00am

Creation Theatre, Level 4 • The Matrix, 30 Biopolis Street, Biopolis

### 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.

### ABOUT THE SPEAKER

Yang Shao-Horn is Gail E. Kendall Professor of Mechanical Engineering and Professor of Materials Science and Engineering at MIT. Her research is centered on the chemical physics of surfaces with emphasis on metal oxides, searching for descriptors of catalytic activity, wetting properties and ion transport, and design materials for electrochemical/photoelectrochemical water splitting and CO<sub>2</sub> reduction, ion/electron storage, and ion conductors.

This seminar is free and no pre-registration is required.

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