CHEMICAL ENGINEERING

SEMINAR SERIES

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Role of Defects in Enhancing the Electrochemical Properties of Transition Metal Oxide

ABSTRACT: Transition metal oxides are an important class of materials that are valued for their catalytic, ferroelectric, superconducting, and optical properties, and hence they find uses in diverse applications, such as heterogeneous catalysts, sensors, solar cells, and high temperature superconductors. Such rich properties of metal oxide are partly enabled by their complex surface chemistry and the presence of lattice vacancies that significantly perturb the electronic structure of the material. Hence, an in-depth understanding of the origin and nature of these defect states is important for further expanding the scope of oxide-based systems for various applications. The focus of this presentation is on elucidating the nature of interaction of various chemicals with defects in strongly correlated metal oxide and its role in inducing various electronic phase transitions. In addition, we show the importance of adsorbed water in promoting such interactions at moderate temperatures. The chemical-structure-property correlations developed in this work can enable rational engineering of a new type of nanoscale, low temperature catalysts having tailored functionality and selectivity that can significantly reduce the energy cost and carbon footprint of many important chemical reactions.

RECEPTION 3:30 • LECTURE 4:00 – 5:00
PHYSICS ASTRONOMY BLDG. (PAA) A110

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BIOGRAPHY: Vidhya Chakrapani is currently an Assistant Professor with a joint appointment in Dept. of Chemical and Biological Engineering and Dept. of Physics at Rensselaer Polytechnic Institute. She completed her PhD at Case Western Reserve University in 2007 and went on to postdoctoral studies at Georgia Institute of Technology and Notre Dame Radiation Laboratory. For the past 15 years, her research has focused on the various fundamental and applied aspects of semiconductor electrochemistry, including photocatalysis, electrocatalysis, solar cells, and Li ion batteries. For her work on diamond electrochemistry, she was awarded the ‚ÄúOutstanding Young Researcher‚Äù award from the Sigma Xi Research Society, Louisville in 2008. In addition, she has won the CBE Outstanding Teaching award and Young Investigator awards from Jawaharlal Nehru Centre for Advanced Scientific Research and the Indian Institute of Science. Her work has been published and highlighted in Science, Nature, Nano Letters and JACS. She has published more than 30 papers in this field along with 3 patents.