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Tuesday, November 12th, 2024, 6:00PM
103 Maeder Hall
86 Olden St, Princeton, NJ 08544

A special lecture from the 2024 NYCS Excellence in Catalysis Awardee

Prof. Eranda Nikolla

Chemical Engineering, University of Michigan

Unlocking the Potential of Cationic Centers in Mixed Metal Oxides for Efficient Catalysis

Shaping the energy landscape toward renewable energy resources is a contemporary challenge, requiring breakthroughs in the design of active, selective and stable catalysts for efficient chemical and energy conversion processes. We focus on engineering complex, nonstoichiometric mixed metal oxides as an avenue for generating robust heterogeneous catalysts for chemical transformations related to energy and chemical conversion that address the limitations with the current state-of-the-art supported metal-based catalytic systems. The compositional versatility of nonstoichiometric mixed metal oxides of the general form $A_{n+1}B_nO_{3n+1}$ (where n = 1 (Ruddlesden-Popper layered structure) to ∞ (perovskite structure)) presents numerous opportunities to tune the catalytic performance of these oxides for targeted reactions. While promising, identification of robust nonstoichiometric mixed metal oxides for these reactions is often limited by their complexity and lack of effective descriptors of their activity and stability.

We have combined controlled synthesis, advanced characterization, kinetic studies, and density functional theory to shed light on the factors that govern the energetics of electro, photon and thermal driven reactions on these oxides. The aim has been to use these insights to identify ways to tune their activity, selectivity and stability. We have shown that (i) the electronic structure of the transition metal cations in these oxides can be systematically tuned via oxide compositional variations to achieve the outmost reactivity for targeted electrochemical reactions such as electrochemical oxygen reduction reaction and electrochemical CO_2 reduction, (ii) the oxide framework can act as a platform for *in situ* generation of highly catalytically active surfaces under oxidative electrochemical conditions, and (iii) single catalytic sites incorporated into photo-active mixed metal oxide structures can be used to influence surface chemistries with visible light. These advances have paved the way for engineering active, selective and stable catalytic cationic sites in nonstoichiometric mixed metal oxides for catalytic reactions with relevance to energy conversion and storage.

Speaker Bio

Eranda Nikolla is a Professor of Chemical Engineering at the University of Michigan-Ann Arbor, MI. Her research interests focus on the development of heterogeneous catalysts for chemical/energy conversion and storage. As an integral part of engineering catalytic structures, Nikolla has implemented a paradigm which involves a combination of controlled synthesis, advanced characterization, kinetic measurements, and quantum chemical calculations to unearth the underlying mechanism that governs their catalytic performance for targeted reactions. Her group's impact to catalytic science has been recognized through the National Science Foundation CAREER Award, the Department of Energy Early Career Research Award, Camille Dreyfus Teacher-Scholar Award, the Young Scientist Award from the International Congress on Catalysis, the 2019 ACS Women Chemists Committee (WCC) Rising Star Award, the 2021 Michigan Catalysis Society Parravano Award for Excellence in Catalysis Research and Development, the 2022 ACS Catalysis Lectureship for the Advancement of Catalytic Science, and the 2023 Maria Flytzani-Stephanopoulos Award for Creativity in Catalysis.

Schedule	
Social Hour	6:00 PM
Dinner	6:45 PM
Presentation	7:30 PM

There will be no student speaker this meeting.

Meeting Fees	
Professional Members	$40
Non-members	$50
Students	$25 (Student Members = $10)
Retired/Post-Doc/Unemp.	$40 (Members = $30)

Deadline for reservations is **5:00PM Sunday, November 10th, 2024**

Please RSVP online using the online form.

To renew your membership, please visit this link.