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Dr. Habas is a Senior Scientist in the Heterogeneous Catalysis for Thermochemical Conversion research group in the National Bioenergy Center (NBC) at the National Renewable Energy Laboratory (NREL). Her research focuses on the design, synthesis, and characterization of nanostructured catalysts with controlled surface chemistries to enable selective transformations of biomass-derived compounds to fuels, chemicals, and materials. Prior to joining NREL in 2009, Dr. Habas received her Ph.D. in Chemistry from the University of California, Berkeley and worked at the Lawrence Berkeley National Laboratory developing highly controlled nanomaterials for catalytic and energy applications.

"Advances in Nanoscale Metal Carbide and Phosphide Catalysts for Biomass Conversion Applications"

Abstract

The realization of sustainable routes to fuels, chemicals, and materials from biomass relies on the effective transformation of highly functionalized compounds into targeted precursors and products using low-cost, earth-abundant catalysts that maintain performance under severe conditions. Addressing these challenges requires advanced catalysts with controlled active sites that promote desired transformations (e.g., hydrogenation, deoxygenation), while resisting deactivation, and that can be produced cost-effectively at relevant scales. Two classes of materials that have the potential to meet many of these goals are transition metal carbides and phosphides. Recently, advances in the controlled nanostructuring of these types of materials has resulted in promising catalytic performance as well as a greater understanding of fundamental structure–function relationships that drive the development of next-generation catalysts. Ongoing research in our group has focused on developing synthetic methodologies that enable precise control of nanoparticle composition and morphology to provide tailored active sites with targeted catalytic reactivity. In this seminar, I will share recent developments from our group on versatile molecular precursor routes to metal and mixed-metal carbide and phosphide nanoparticles, how these approaches allow us to control the balance of acidic and metallic active sites in the resulting catalytic materials, and the impact that these modifications have on key transformations of model biomass compounds. Finally, I will provide an outlook on the catalytic potential of nanostructured metal carbides and phosphides for emerging biomass conversion processes and the requirements that need to be met to produce these novel catalysts at scale.

Thursday, November 16th, 2017 | 11:00 – 11:50AM
2 Eaton Hall (Spahr Auditorium)