

Materials Chemistry Seminar

Friday, January 12, 2024
11:30 a.m. ~ BRWN 4102

"Elucidating the Active Site in Heterogeneous OH-Directed Hydrogenation Using Pt-Cu Bimetallic Alloy Catalysts"



Joanna M. Rosenberger

Graduate Student, Purdue University

Abstract:

Recently, our group showed that heterogeneous bimetallic alloy catalysts comprising of a noble metal and a base metal are capable of hydroxyl-directed hydrogenation to access consistent counter-steric selectivity. However, we were unable to ascertain the exact nature of the bimetallic active site due to structural heterogeneity in the catalyst. Utilizing colloiddally synthesized Pt-Cu alloy catalysts of different ratios allows us to probe the effects of the Pt-ensemble in the rate of directed hydrogenation with a greater degree of precision. The role of the Cu-O shell is identified by exposing the nanoparticle catalysts to different reductive conditions, effectively controlling the amount of Cu-O shell present. Utilizing kinetic experiments and DFT to probe the reaction mechanisms as well as characterization techniques such as CO DRIFTS, EXAFS, and XPS allows us to probe differences in Cu-O and Pt ensemble. Our results ultimately prove that the Pt ensemble is the determining surface feature that increases activity in OH-directed hydrogenation.

Group Members: Joanna M. Rosenberger, Wei Hong, Mona Abdelgaid, William A. Swann, Nkem Azuka, Giannis Mpourmpakis, Christina W. Li Purdue University

Bio:

Joanna Rosenberger is a third year PhD candidate. Joanna earned her Bachelor of Arts in chemistry in 2021 from Transylvania University, where she synthesized and characterized transition metal chalcogenide complexes. She joined the Li Lab in 2021, where her current work focuses on understanding how nanoparticle surfaces control selectivity and reactivity in catalysis. In her free time, she enjoys reading fantasy novels and cooking.