

Chemical Engineering Seminar Series

Dr. Bert Chandler
Professor of Chemistry

Trinity University
Department of Chemistry



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Via Zoom:
<https://psu.zoom.us/j/909448151>

11:00 - 12:00 pm

Mechanistic Insights into Small Molecule Activation over Gold Catalysts

Abstract

Supported gold nanoparticles are now well known to be exceptionally active CO oxidation catalysts and have shown excellent activity and selectivity in the Preferential Oxidation of CO in H₂ feeds. Additionally, Au has desirable selectivity in a number of selective and partial-hydrogenation reactions; however, hydrogenation activity is notoriously low. This seminar will focus on our efforts to develop kinetic tools to better understand supported gold catalysts, particularly our developing mechanistic understanding of both the CO and H₂ oxidation reactions. We are especially interested in understanding the special role of the metal-support interface in Au-catalyzed reactions, particularly the ability of this system to transfer electrons between the Au and oxide. We apply a number of mechanistic chemistry techniques, such as Hammett studies, kinetic isotope effects, and Michaelis-Menten kinetics, to better understand how support effects and water tune the chemistry of Au nanoparticle surfaces. These studies, combined with collaborative density functional theory calculations, have led us to a deeper understanding of O₂ and H₂ activation at the Au-support interface and have led to significant advances in CO PrOx catalysis. We further extend this work to alkyne partial-hydrogenation, where the addition of Au to supported Ni catalysts dramatically improves catalyst performance.

Biosketch

Bert Chandler earned a BS in Chemistry from Georgia Southern University (1994) and a PhD in Inorganic Chemistry from the University of Minnesota (1999), working with Prof. Lou Pignolet. He went on to a postdoctoral fellowship in the Department of Chemical Engineering at the University of South Carolina with Prof. Michael Amiridis. He began a faculty position at Trinity University in San Antonio, TX, in 2001 and is currently Professor of Chemistry. He has served as the chair of the Southwest Catalysis Society, on the Board of Directors of the Organic Reactions Catalysis Society, and on the Scientific Advisory Committee for the Research Corporation for Science Advancement. His long term research interests are in nanoparticle synthesis and properties, particularly as applied to heterogeneous catalysts and reaction mechanisms at the metal-support interface. This has included applying various physical organic chemistry techniques and Michaelis-Menten kinetics to understand changes to nanoparticle catalysts under reaction conditions.