

Physics Colloquium

Michigan Technological University

Thursday, November 12, 2009 at 4:00 pm

Room 139 Fisher Hall

From Atoms to Nanoparticles and Surfaces: Atomically resolved models in Heterogeneous Catalysis



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Abstract: In catalysis research, the ultimate goal is to design and tune activity and selectivity of catalysts by controlling their structural properties at the atomic level. Surface science, the field initiated by 2007 Chemistry Nobel Laureate G. Ertl at the Fritz-Haber-Institute, reveals how chemical reactions occur when molecules hit a solid surface. Understanding molecular scale processes in heterogeneous systems is essential to green energy conversion technologies and progress in green chemistry. This presentation will show how complex model systems can be prepared, by synthesizing thin oxide films (SiO_2 , CeO_2) as substrates for deposition of atoms and nanoparticles (Pd , Au , TiO_x , CeO_x). Reactivity results on the Water-Gas-Shift reaction, essential for the preparation of pure hydrogen, and their interpretation with theoretical studies will be presented. This approach allows incorporating some of the complexity of real catalysts while retaining an atomic level control and understanding of the system

Biography: Dr. Stacchiola finished his Bs. in Physics in Argentina and completed his PhD at the University of Wisconsin, Milwaukee in 2002. He then gained additional experience as a Humboldt Research Fellow at the Fritz-Haber-Institute, Max-Planck-Society in Berlin and as a research associate at Brookhaven National Laboratory. He joined the Department of Chemistry at Michigan Technological University in June 2009. He has more than 60 publications, ranging from the purely theoretical “Theoretical analysis of the coverage dependence of enantioselective chemisorption on a chirally templated surface” (J. Chem. Phys. 118, 6030-6037, 2003) to the highly practical “Controlling the Nature of Mixed-Metal Oxide Catalysts at the Nanometer Level: High Activity of $\text{Au/CeO}_x/\text{TiO}_2(110)$ in the Water-Gas Shift Reaction” (Proc. Natl. Acad. Sci. U.S.A. 106, 4975-4980, 2009).