

SPECIAL PHYSICAL CHEMISTRY SEMINAR

Thursday
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3:00 pm

Room 8335
Chemistry

Subsurface Oxygen on Catalytically Active Metals



Professor Daniel Killelea

*Department of Chemistry
Loyola University Chicago*

Host: Gil Nathanson

Understanding the interaction of oxygen with transition metal surfaces is important in many areas including corrosion and catalysis. Of particular interest is the formation and chemistry of subsurface oxygen; oxygen atoms dissolved in the near-surface region of the catalytically active metal. The oxygen – silver system in particular has been studied extensively both experimentally and theoretically because of its role in two widely used, heterogeneously catalyzed, industrial reactions: the epoxidation of ethylene to produce ethylene oxide and the partial oxidation of methanol to produce formaldehyde. In addition, the oxygen – silver system can serve as a model for the dissociative chemisorption of diatomic molecules on close packed metal surfaces. Despite extensive research, there remain questions about the fundamental chemistry of the oxygen – silver system. In particular, the structure of the catalytically active surface remains poorly understood under conditions of high oxygen coverages or subsurface oxygen. To improve our understanding of this system, we use ultra-high vacuum surface science techniques to characterize silver surfaces after adsorption of atomic O on an Ag(111) crystal. Atomic O is generated by thermally cracking molecular O. We then use LEED and UHV-STM to further characterize the various oxide structures produced, and quantify the amount of oxygen with TPD. We have found that the surface temperature during deposition is an important factor for the availability of subsurface oxygen on the surface and have characterized the product surface structures after several differing deposition conditions. We compare our findings to oxygen adsorption on Rh(111), a system with limited surface reconstruction.