Department of Mathematics and Statistics Colloquium

Atomic-Scale Surface Chemistry of Model Catalysts

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Abstract: Scanning tunneling microscopy (STM) was used to investigate the atomic-scale electronic and geometric structure of Pd/Au and Pd/Cu bimetallic model catalysts, as well as their interaction with hydrogen, a vital component in alcohol synthesis and water-gas shift reactions. Individual, isolated Pd atoms in an inert Cu matrix are active for the dissociation of hydrogen and subsequent spillover onto Cu sites, but no H was found under the same H2 flux on a Pd/Au samples with identical atomic composition and geometry. These results demonstrate the powerful effect of the substrate on the catalytic activation of Pd atoms supported within or on its surface. To obtain a full picture of the morphological and chemical changes during model catalytic studies, X-ray photoelectron spectroscopy (XPS) experiments, from ultrahigh vacuum to near-ambient pressure (NAP) conditions, are presented to provide insight into the correlation between adsorbate identity and model catalysts structure. The reduction of Cu_2O/Cu(111) under NAP of CO by a combination of in situ STM and XPS provide insight into the highly reducing environment of the water gas shift reaction on a model oxide surface. Systematic studies allow us to identify intermediate structures and determine how reaction fronts propagate across a surface with nanoscale resolution.

Monday, November 30 at 3:45 in Roop 103

refreshments at 3:30