

Probing Surface Reaction Mechanisms

Determining the mechanisms of surface reactions has been a major theme of surface chemistry throughout its development. One motivation for studying the reaction mechanisms on surfaces is to find cheaper alternatives to expensive catalyst materials such as platinum. My students and I have performed temperature programmed reaction spectroscopy (TPRS) experiments in a UHV chamber (see below) at Wellesley College to probe the reactions of ethylene glycol ($\text{HOCH}_2\text{CH}_2\text{OH}$) on a well-defined molybdenum surface ($\text{Mo}(110)$). In addition, in the laboratory of Dr. Cynthia M. Friend at Harvard, we have used several spectroscopic techniques to identify and characterize two surface intermediates formed during the reactions of ethylene glycol on $\text{Mo}(110)$. A detailed analysis of the spectroscopic data has also revealed the orientation of the two intermediates on the $\text{Mo}(110)$ surface. Such structural information is exceedingly important in creating models of how a catalyst works. A manuscript pertaining to this work has been published in the Journal of the American Chemical Society.