JAMES MADISON UNIVERSITY

# SEMINAR
## Friday, September 19


## Dr. Ashleigh Baber

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# Model Catalyst Chemistry: Where Form Meets Function


**Abstract:** Surface science provides a powerful framework for exploring the fundamental nature of model heterogeneous catalysis, with the goal of enhancing reactivity, improving selectivity, and identifying active sites. Our research group utilizes ultrahigh vacuum temperature-programmed reaction spectroscopy (UHV-TPRS) to probe catalytic reactivity, complemented by low-temperature scanning tunneling microscopy for atomic-scale visualization of model catalysts. This presentation will be divided into two parts. First, we examine the molecular assembly of R-2-butanol on Ni(111) surfaces, revealing a pronounced contrast to its behavior on inert Au substrates. The absence of ordered assembly on Ni is attributed to its oxophilic nature and strong molecule–metal interactions. Second, we explore the role of hydroxyl groups as reactive oxygen species in the epoxidation of ethylene and propylene over Ag/Cu(111) model catalysts. The presence of Ag and hydroxyls promotes selective partial oxidation to epoxides while suppressing overoxidation to combustion products. By elucidating the relationship between surface structure and catalytic activity, this work contributes to the rational design of more efficient catalysts for industrial applications—enhancing performance, reducing waste, and mitigating $CO_2$ emissions.


## Seminar

## 3:30 pm, King 159