Cassandra Freyschlag

Graduate Institution: Harvard University

Location: Cambridge, MA

Graduate Discipline: Environmental Chemistry

Hometown: Colorado Springs, CO

Research Interests:

Catalytic processes have made huge impacts industrially in enabling low-cost, energy-saving synthetic processes. Fundamental research under Ultra High Vacuum (UHV) allows us to understand reaction products, mechanisms, and rate-limiting steps for various reactions. With knowledge of the fundamental chemistry occurring on catalyst surfaces, we can efficiently predict and optimize highly selective reactions as well as give insight to solution phase catalysis. Currently, I am using silver and gold as model catalysts to look at cross-coupling reactions with amines, alcohols, and aldehydes to form amides. By studying these reactions using Temperature Programmed Reaction Spectrometry (TPRS), and various spectroscopic techniques, we hope to fully understand the catalyst-promoted reaction mechanisms and the intermediates on the surface. Another aspect of my research includes working with Au/Ag alloys as model catalysts. Alloys frequently display increased 'synergistic' activity, with reactivity having a non-linear and non-additive dependence on alloy composition. We hope to study the effects of alloy composition using well-controlled UHV conditions. Using alloy composition, one may be able to tune the selectivity of a reaction process. Also, we can hopefully 'mimic' nanoporous gold (<5% Ag), which has very interesting properties, as well as catalyst potential.

About me:

I am from Colorado, but moved to the Boston area for undergraduate studies at Gordon College. Now at Harvard in the School of Engineering and Applied Sciences, I am involved in the Graduate Consortium on Energy and the Environment, participating in classes and seminars that deal with environmental, energy, and climate issues. This speaks to my overarching career goals, which include working for greater energy efficiency, as well as alternative energies, using fundamental chemistry. Another interest of mine is to address seeming 'conflicts' between popular opinions of climate change and energy issues and that of the scientific community. I believe it is extremely important to understand where people are coming from when approaching these topics, and the communication/writing/teaching arena is quite interesting to me in that regard. My hobbies include choir, skiing, and backpacking.