

Mahdi Abu-Omar

Mahdi Abu-Omar and his research group are interested in interdisciplinary research encompassing bioinorganic and catalytic/environmental chemistry. Our investigations of transition metal catalysts are aimed at defining the scope of their utility as well as the origin of their high reactivity and selectivity. We determine reaction mechanisms by studying chemical kinetics, characterizing intermediates, and developing structure-function correlations. Our studies focus on understanding the mechanism(s) of enzymatic and catalytic transformations sufficiently well that we could rationally design practical catalysts that either i) convert conveniently readily available reagents into valuable products, or ii) activate chemical bonds previously considered to be inert.

Over the past five years, our catalytic studies have focused on oxygen and nitrogen transfer chemistry mediated by oxo and imido complexes of the elements rhenium, chromium, and manganese. New compounds are prepared and characterized by multinuclear NMR and by single crystal X-ray diffraction methods. An attractive feature of our research program is the ability to make and measure. Graduate students are often given the freedom to be innovative and design their own research projects.

On the bioinorganic front, we have been investigating oxygen activation and the reaction chemistry of non-heme oxygenases as exemplified by bacterial and human phenylalanine hydroxylase. Point mutants are rationally designed, prepared, and fully characterized by a variety of biophysical techniques in order to define relationships between structure and function. Researchers in the group perform routinely cloning, protein expression, as well as spectroscopic characterizations. Most commonly employed biophysical characterization methods include enzyme kinetics, CD, MS, DSC, ITC, and EPR.