

Investigations of bio-inspired transition metal catalysts. (*Prof. Timothy A. Jackson*)

Metalloenzymes (enzymes that require transition metals such as iron, manganese, or copper) are involved in many vital biological processes, some of which are of practical interest for industrial applications. For example, the enzyme manganese peroxidase degrades lignin (a major component of plant cell walls), a reaction required in the efficient generation of ethanol from biomass. In the Jackson group we seek to interrogate metalloenzymes such as manganese peroxidase to determine factors contributing to their reactivities, and then use these as principles to develop environmentally friendly catalysts. The goal of this REU project is to develop useful oxidation catalysts for lignin or similar substrates. Students will synthesize ligands and generate transition metal complexes. The catalytic efficacy of these complexes will then be evaluated with respect to specific oxidation reactions, with the goal of learning how ligand properties affect catalyst efficiency and selectivity. Students will also gain insight into the mechanisms of these oxidation reactions by trapping and characterizing intermediates using cryogenic, spectroscopic techniques. This project will thus afford experience in ligand synthesis, complex generation, and the use of spectroscopic methods, such as low-temperature UV-vis spectroscopy, to trap unstable intermediates.