5th Annual
Creative Activities & Research Symposium

Project Title: Molybdenum and Vanadium- Catalyzed Oxidative Cleavage of Lignin

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Abstract: Depleting fossil fuels has been undergoing issue that calls for the attention of many scientists around the world, as the demand for it increases with the increasing population. Thus, various types of renewable energy sources are being studied and evaluated to determine which can accommodate the world's growing demand. One of the best renewable resources in nature is biomass. Among several components of plants, lignin, a complex organic polymer, is one of the most abundant. It contains copious amounts of various aromatics connected together by β-O-4 linkages and breaking these linkages will break the complex lignin into simpler aromatics that make up petroleum-derived chemicals. The goal of this study is to show how different transition metal complexes catalyze oxidative cleavage of the β-O-4 linkage. This study, however, is focused on using Molybdenum and Vanadium complexes as catalysts. These complexes are synthesized in the lab by combination of organic ligand and metal bound to a "backbone". Various ligands composed of bulky, aromatic functional groups backbone with substituents are investigated for the changes in reaction specificity, due to varying substituents on the aromatic rings that are involved in the oxidative cleavage of the model lignin compound. The ligands and proceeding organometallic complexes are synthesized as part of the project. The synthetic complexes are then used for cleaving the β-O-4 linkage of lignin model compounds to determine which functional products were present, and the selectivity of each complex. Data is analyzed using NMR and GC-MS. Our findings along these lines will be discussed.