Volume 12

Washington University
Undergraduate Research Digest

Spring 2017

Catalytic Hydrogenolysis of Aryl Ether Substrates

Alex Brown
Washington University in St. Louis

Toward a Better Understanding of...

Catalytic Hydrogenolysis of Aryl Ether Substrates

Alex Brown

Mentor: John Bleeke

The goal of our work is to replicate the procedure for the selective catalytic hydrogenolysis of aryl ethers as determined by preliminary research done at the University of Illinois by the Hartwig lab. Upon confirming the procedure, we hope to further test its efficacy on larger aryl ether substrates, and eventually Lignin. The importance of this project would be adding further knowledge to the existing literature on this topic. The belief in the scientific community is that selectively cleaving Lignin could lead to products that can be utilized as alternative fuel sources, which would have a significant impact on future options for combating the ongoing climatic change that our planet faces. We used commercial ether substrates, homogenous Ni-catalysts, N-heterocylic Carbene (NHC) ligands, and commercial bulky bases to further investigate the procedure implemented by the Hartwig lab. Our lab's investigation of small aryl ether substrates produced inconclusive results so far in that phenol products, our target product, were rarely produced by the reaction in combination with all the starting material being used up. In other words, the reaction rarely went to completion. What we know from the results of the reactions is that Benzyl Phenyl Ether (BPE) was a more effective substrate than Diphenyl Ether (DPE) in terms of being selectively cleaved to produce phenol products. More importantly, we have reason to believe that the reaction is capable of running to completion without the use of the NHC ligands. In fact, it is very possible that the NHC ligands blocked the reactions from working as well as we had hoped. Our investigation into this possibility is ongoing. Synthesis of bulkier Ni-catalysts will likely be done for the larger ether substrates like Lignin.