Volume 12
Washington University Undergraduate Research Digest

Spring 2017

Extracting Lignin Using Deep Eutectic Solvents

Wilson Zhong
Washington University in St. Louis

Extracting Lignin Using Deep Eutectic Solvents

Wilson Zhong

Mentor: Marcus Foston

The conversion of biomass into fuels and other products is a costly and inefficient process. Lignocellulosic biomass contains carbohydrates such as cellulose and hemicellulose which can be converted to fuels such as ethanol. However, it also contains lignin, a complex polymer that has the potential to be a renewable resource for a wide variety of high value products, such as aromatic chemicals. Unfortunately, current biomass fractionation methods degrade the lignin's structure, making it unusable for conversion into high value products. If lignin can be successfully extracted from biomass, with its desirable structure intact, we can increase the economic viability of biomass refineries, putting us a step closer to renewable energy. Initially ionic liquids were examined for their use in biomass fractionation to successfully extract lignin with its structure relatively intact. However, these ionic liquids were found to be too toxic and expensive for industrial use. Currently, we are testing the ability of deep eutectic solvents (DES) to extract lignin from dry poplar flour. DES are mixtures of two substances, that when combined in specific ratios, have a significantly lower melting point than either of the individual substances. DES have similar physiochemical properties to ionic solvents; however, they are safe, cheap, and more environmentally friendly. Our research is dedicated to determining whether biomass fractionation is possible using DES, and if so to identify which solvents are the most effective at extracting lignin from biomass. One of the solvents we tested, Choline Chloride and Urea in a 1:2 ratio, was found to be significantly better at extracting lignin than the other DES, and even the ionic liquid. Moving forward we wish to test more DES combinations and to determine the structure of the extracted lignin to see if it is usable as a feedstock for lignin-derived products.