FRACTIONATION OF LIGNOCELLULOSIC BIOMASS USING IONIC LIQUID 1-ETHYL-3-METHYLIMIDAZOLIUM ACETATE ([EMIM][CH_3COO])

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As the global transportation and industrial sectors continue to grow, lignocellulosic biomass has become a potential alternative to fossil fuels in producing fuels and chemicals. Lignocellulosic biomass consists of lignin, cellulose, and hemicellulose, held together in a rigid cell structure that is resistant to degradation. For better sustainability, biomass recalcitrance must be reduced in order to fractionate and utilize the entire feedstock. Among several fractionation methods, studies have found ionic liquids (ILs) to be an ideal solvent. Ionic liquids provide a pathway to separate and produce streams of lignin, hemicellulose and cellulose. This study uses the IL 1-ethyl-3-methylimidazolium acetate ([emim][CH_3COO]) to fractionate a hardwood (hybrid poplar) and softwood (Norway spruce). An autohydrolysis step was carried out before the IL activation in order to remove 55% and 51% hemicellulose in hybrid poplar and Norway spruce, respectively. Following activation in [emim][CH_3COO] at 60°C for 3 hours, enzymatic saccharification was performed to hydrolyze carbohydrates into mono-sugars and generate a lignin-rich solid fraction. Data on carbohydrate conversion yields and kinetics showed the significance of autohydrolysis prior to IL activation in generating highly pure cellulose and lignin. Saccharification of hybrid poplar converted 87% cellulose and 81% hemicellulose into mono-sugars, yielding lignin of 90% purity. The enzymatic hydrolysis on Norway spruce converted 76% cellulose and 80% hemicellulose into mono-sugars, resulting in 82% pure lignin. This poster will compare hardwood and softwood bioenergy feedstocks to better understand and improve biomass fractionation using ionic liquids.