ACTIVATION OF LIGNOCELLULOSIC BIOMASS IN IONIC LIQUIDS

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With the growing interest in utilizing renewable carbon from lignocellulosic biomass, improved activation and fractionation processes are needed to establish viable biorefineries by providing saccharide streams for production of fuels and a lignin fraction for the production of high value co-products such as carbon fibers. This study includes analysis of three feedstocks (switchgrass, hybrid poplar, and pine) after activation in ionic liquid at low temperatures. The biomass is first dissolved in the ionic liquid and regenerated with a co-solvent prior to analysis. This ionic liquid approach has shown to include physio-chemical changes to the biomass cell wall, including a decrease in the cellulose crystallinity and deacetylation of the biomass, shown previously to reduce the recalcitrance in Yellow poplar. A series of characterization techniques will follow to compare the feedstocks before and after activation, including infrared spectroscopy and corresponding statistical characterization techniques, classical wet chemistry methods for determination of chemical composition, calculation of the ratio of syringyl to guaiacyl units, Pyrolysis Gas Chromatography Mass Spectrometry (Py/GC/MS), and electron microscopy. Through comparison of the herbaceous, hardwood, and softwood bioenergy feedstocks, a better understanding of the activation process and resulting pretreated biomass ideally precedes enzymatic conversion of the cellulose and hemicellulose fractions, allowing for isolation of lignin with minimal structural changes.