435i Improving Ethanol Yields from Lignocellulosic Biomass Using a Novel Pretreatment

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Ethanol is an important alternative fuel that may be produced biologically from lignocellulosic biomass such as softwood (Ponderosa pine) sawdust. Ponderosa pine is abundant in western South Dakota and sawdust is cheaply recovered as a waste product. To facilitate the yeast fermentation to ethanol, the components of lignocellulosic biomass must be broken down via pretreatment. Pretreatment effectiveness was measured using enzyme hydrolysis and simultaneous saccharification and fermentation (SSF) of the treated wood. Initial research investigated a novel batch pretreatment process, where glucose/ethanol yields were measured as a function of temperature, pressure, residence time, and moisture content of wood. Enzyme hydrolysis results from the batch pretreatment process were encouraging, with glucose recoveries of 60-70% at the optimal pretreatment conditions. Preliminary SSF results indicate that toxic products are produced in this batch pretreatment, as no ethanol was produced in the experiments using pretreated, unwashed wood as a substrate. The focus of the current work is to modify the pretreatment from a batch to continuous process and to minimize the production of toxic byproducts.