Bioethanol Production from Lignocellulosic Biomass

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For the bioethanol production, Oak wood and waste oak wood, lignocellulosic biomass were pretreated with aqueous NH_3 in a flow-through column reactor, Ammonia Recycled Percolation (ARP), for ethanol production through Simultaneously Saccharification and fermentation (SSF). This pretreatment method is highly effective in delignification and in hemicellulose solubilization of lignocellulosic biomass. We have previously investigated on various pretreatment processes using a flow-through (percolation) reactor system in our laboratory. The primary purpose of this investigation is to assess the effectiveness of the ARP treatment as a pretreatment process specifically for oak wood. We were interested in verifying the changes in chemical composition and physical characteristics of biomass brought about by the pretreatment and how those factors affect the enzymatic digestibility. Most of the lignin removal occurred within the first 20 minutes of the reaction. The ARP process solubilizes 40-50% of the hemicellulose in liquor but leaves the cellulose content intact in solid. The solubilized carbohydrate exists in olgomeric form. Decomposition of carbohydrates during the pretreatment is insignificant. The digestibility of the treated waste oak wood is substantially higher than those of α-cellulose. The enzymatic digestibility is correlated with the extent of lignin removal and hemicellulose removal perhaps due to increased surface area and porosity. Conversion of cellulosic biomass to ethanol involves SSF.