UNDERSTANDING THE EFFECTS OF REACTOR DESIGN ON GLUCOSE AND XYLOSE RECOVERY FROM PRETREATMENT AND ENZYMATIC HYDROLYSIS OF CELLULOSIC BIOMASS

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Pretreatment is a key step in the production of ethanol from cellulosic biomass and is essential to high sugar yields from enzymatic hydrolysis. High temperature water or dilute acid can be employed to primarily solubilize sugars and oligomers from hemicellulose during pretreatment, and cellulase enzymes can access the cellulose left in the pretreated solids and convert it to predominantly glucose. The sugars from both operations can then be fermented to ethanol or other products. Although many different reactor designs, sizes, and heating mechanisms have been applied for water only and dilute acid pretreatment of a number of cellulosic materials, little attention has been given to correlating the results from these different reactor scales and configurations or evaluating the effect of reactor design features on their performance. The goal of this study is to compare results for water only pretreatment of poplar wood in stirred and non-stirred batch reactors heated by either a fluidized sand bath or steam. In addition, the heat transfer performance of each device will be analyzed as a possible source of variations in performance. The resulting correlations will provide new insight into factors controlling pretreatment performance and enable scale up to larger reactors.