Optimization of pH Controlled Liquid Hot Water Pretreatment of Corn Stover

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Abstract

Controlled pH, liquid hot water pretreatment of corn stover has been optimized for enzyme digestibility with respect to processing temperature and time. This pretreatment technology does not require the addition of chemicals such as sulfuric acid, lime, or ammonia that add cost to the process because these chemicals must be neutralized or recovered in addition to the significant expense of the chemicals themselves. Second, an optimized controlled pH, liquid hot water pretreatment process maximizes the solubilization of the hemicellulose fraction as liquid soluble oligosaccharides while minimizing the formation of monomeric sugars. The optimized conditions for controlled pH, liquid hot water pretreatment of a 16% slurry of corn stover in water was found to be 190°C for 15 minutes. At the optimal conditions, 90% of the cellulose was hydrolyzed to glucose by 15 FPU of cellulase per gram of glucan. When the resulting pretreated slurry, in undiluted form, was hydrolyzed by 11 FPU of cellulase per gram of glucan, a hydrolyzate containing 32.5 g/L glucose and 18 g/l xylose was formed. Both the xylose and the glucose in this undiluted hydrolyzate were shown to be fermented by recombinant yeast 426A (LNH-87) to ethanol at 88% of theoretical yield.