

Enhancement of the enzymatic digestibility of sugarcane bagasse by alkaline hydrogen peroxide pretreatment

Rabelo, S.C.^{1,2}; Maciel Filho, R.²; Costa, A.C.²

¹ Laboratório Nacional de Ciência e Tecnologia do Bioetanol (CTBE), Brazil

² Faculdade de Engenharia Química, Universidade Estadual de Campinas (UNICAMP), Brazil

Sugarcane bagasse is one of the potential lignocellulosic feedstocks for bioethanol production. The ethanol yield depends on the efficiency of conversion of glucans and xylans to fermentable sugars without generating byproducts that are toxic to fermentative microorganisms. Thus, the rate and extent of enzymatic hydrolysis of lignocellulosic biomass is very important and highly dependent on enzyme loadings, hydrolysis times, and structural features resulting from pretreatments.

In this work, the alkaline hydrogen peroxide pretreatment of sugarcane bagasse was proposed and evaluated. Studies were performed using statistical analysis considering pretreatment time, temperature and hydrogen peroxide concentration as factors. The process was optimized based in pretreatment and glucose yields after enzymatic hydrolysis in fixed conditions.

Moreover, the optimization of enzymes load in the best condition of the pretreatment was evaluated through statistical analysis.

Results showed that maximum release of glucose can be obtained at 25°C with H₂O₂ concentration of 7.36% for 1 h at pH 11.5. The results of the sugars concentration released after hydrolysis at 50 °C, pH 4.8 and enzyme loading of 3.5 FPU/g dry pretreated biomass and 1.0 IU/g dry pretreated biomass, were 0.380 g/raw dry biomass of glucose and 0.158 g/g raw dry biomass of xylose, corresponding to cellulose conversion of 83.4%.

Regarding the enzymatic optimization, the best result can be obtained using 12.7 FPU/g dry pretreated biomass and 25.0 CBU/g of dry pretreated biomass for cellulase and β -glucosidase, respectively, when glucose and xylose are sugars of interest, with yields of 100.0% glucose and 98.7% xylose. When only glucose is the sugar of interest to fermentation, we can choose a lower enzyme loading, using 3.5 FPU/g dry pretreated bagasse of cellulase and 25.CBU/g of dry pretreated bagasse of β -glucosidase for yields of 100.0% glucose and 31.1% xylose.

Supported by Fapesp

This document was created with Win2PDF available at <http://www.win2pdf.com>.
The unregistered version of Win2PDF is for evaluation or non-commercial use only.
This page will not be added after purchasing Win2PDF.