PRETREATMENT OF SUGARCANE BAGASSE USING SUPERCRITICAL CARBON DIOXIDE TO IMPROVE THE ENZYMATIC HYDROLYSIS

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Conversion of lignocellulosic material to ethanol requires hydrolysis of carbohydrate polymers to their constituent sugars. Pretreatment accomplishes a variety of alterations to the biomass, typically including, to varying degrees: hydrolysis of the hemicellulose, solubilization of lignin and carbohydrate oligomers, and increased accessibility of the cellulose to cellulase enzymes. In a first step the influence of process variables on the CO_2-SC pretreatment to enhance the enzymatic hydrolysis was evaluated by mean of a Plackett-Burmann design.The independent variables were temperature (40 to 80 °C), pressure (100 to 250 bar), depressurization rate (50 to 200 $kg.m^{-1}.min^{-1}$), humidity (45 to 65%) and time (30 to 120 min). The best results were obtained a mean value of 356 $g.kg^{-1}$. In terms of dry mass of bagasse this value corresponds to an efficiency of hydrolysis of 35.6%. However, if it is considered only the content of cellulose of the bagasse (480 ± 20 $g.kg^{-1}$), the efficiency is in fact 74.2%. Taking into account the content of fermentable sugar obtained in the control test (non-treated bagasse) that was 127 ± 16 $g.kg^{-1}$, verified an increase about 280% in the content of fermentable sugar after the pretreatment using CO_2-SC. Showing that this method can be used to the treatment of lignocellulosic material to improve the efficiency of enzyme hydrolysis.

Keywords: Sugarcane bagasse, supercritical carbon dioxide, enzymatic hydrolysis.

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