

Optimization of Diluted Organic Acid Pretreatment on Rice Straw Using Response Surface Methodology

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Abstract : Lignocellulosic material is a substance that is resistant to be degraded by microorganisms or hydrolysis enzymes. To be used as materials for biofuel production, it needs pretreatment process to improve efficiency of hydrolysis. In this work, chemical pretreatments on rice straw using three diluted organic acids, including acetic acid, citric acid, oxalic acid, were optimized. Using Response Surface Methodology (RSM), the effect of three pretreatment parameters, acid concentration, treatment time, and reaction temperature, on pretreatment efficiency were statistically evaluated. The results indicated that dilute oxalic acid pretreatment led to the highest enhancement of enzymatic saccharification by commercial cellulase and yielded sugar up to 10.67 mg/ml when using 5.04% oxalic acid at 137.11 °C for 30.01 min. Compared to other acid pretreatment by acetic acid, citric acid, and hydrochloric acid, the maximum sugar yields are 7.07, 6.30, and 8.53 mg/ml, respectively. Here, it was demonstrated that organic acids can be used for pretreatment of lignocellulosic materials to enhance of hydrolysis process, which could be integrated to other applications for various biorefinery processes.

Keywords : lignocellulosic biomass, pretreatment, organic acid response surface methodology, biorefinery

Conference Title : ICBAE 2015 : International Conference on Biotechnology and Agricultural Engineering

Conference Location : Tokyo, Japan

Conference Dates : May 28-29, 2015