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Kinetic study of enzymatic hydrolysis of acid-pretreated coconut coir

Akbarningrum Fatmawati[1,a)] and Rudy Agustriyanto[1,b)]

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a) corresponding author: akbarningrum@ubaya.ac.id

b) another author: us6193@yahoo.com

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Biomass waste utilization for biofuel production such as bioethanol, has become more prominent currently. Coconut coir is one of lignocellulosic food wastes, which is abundant in Indonesia. Bioethanol production from such materials consists of more than one step. Pretreatment and enzymatic hydrolysis is crucial steps to produce sugar which can then be fermented into bioethanol. In this research, ground coconut coir was pretreated using dilute sulfuric acid at 121°C. This pretreatment had increased the cellulose content and decreased the lignin content of coconut coir. The pretreated coconut coir was hydrolyzed using a mix of two commercial cellulase enzymes at pH of 4.8 and temperature of 50°C. The enzymatic hydrolysis was conducted at several initial coconut coir slurry concentrations (0.1-2 g/100 mL) and reaction times (2-72 hours). The reducing sugar concentration profiles had been produced and can be used to obtain reaction rates. The highest reducing sugar concentration obtained was 1,152.567 mg/L, which was produced at initial slurry concentration of 2 g/100 mL and 72 hours reaction time. In this paper, the reducing sugar concentrations were empirically modeled as a function of reaction time using power equations. Michaelis-Menten kinetic model for enzymatic hydrolysis reaction is adopted. The kinetic parameters of that model for sulfuric acid-pretreated coconut coir enzymatic hydrolysis had been obtained which are V_M of 3.587×10^4 mg/L.h, and K_M of 130.6 mg/L.

Key Topics

- Reaction kinetics modeling
- Enzyme kinetics
- Slurries
- Acids
- Biofuels