Hydrothermal pretreatment enhanced enzymatic hydrolysis and glucose production from oil palm biomass

ABSTRACT

The present works investigate hydrothermal pretreatment of oil palm empty fruit bunch and oil palm frond fiber in a batch tube reactor system with temperature and time range from 170 to 250 °C and 10 to 20 min, respectively. The behavior of soluble sugars, acids, furans, and phenols dramatically changed over treatment severities as determined by HPLC. The cellulose-rich treated solids were analyzed by SEM, WAXD, and BET surface area. Enzymatic hydrolysis was performed from both pretreated slurries and washed solid, and data obtained suggested that tannic acid derived from lignin degradation was a potential cellulase inhibitor. Both partial removal of hemicellulose and migration of lignin during hydrothermal pretreatment caused structural changes on the celluloseï hemicelluloseï lignin matrix, resulting in the opening and expansion of specific surface area and pore volume. The current results provided important factors that maximize conversion of cellulose to glucose from oil palm biomass by hydrothermal process.

Keyword: Oil palm biomass; Hydrothermal pretreatment; Tannic acid; Specific surface area; Enzymatic hydrolysis