

Combined pretreatment using alkaline hydrothermal and ball milling to enhance enzymatic hydrolysis of oil palm mesocarp fiber

Abstract

Hydrothermal pretreatment of oil palm mesocarp fiber was conducted in tube reactor at treatment severity ranges of $\log R_o = 3.66\text{--}4.83$ and partial removal of hemicellulose with migration of lignin was obtained. Concerning maximal recovery of glucose and xylose, 1.5% NaOH was impregnated in the system and subsequent ball milling treatment was employed to improve the conversion yield. The effects of combined hydrothermal and ball milling pretreatments were evaluated by chemical composition changes by using FT-IR, WAXD and morphological alterations by SEM. The successful of pretreatments were assessed by the degree of enzymatic digestibility of treated samples. The highest xylose and glucose yields obtained were 63.2% and 97.3% respectively at cellulase loadings of 10 FPU/g-substrate which is the highest conversion from OPMF ever reported.

Keyword: Oil palm mesocarp fiber; Ball mill; Alkaline hydrothermal; Xylose; Glucose