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Hydrothermal Pretreatment of Mixed Oil Palm Biomass

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Abstract. Oil palm biomass has high amount of carbohydrates which potentially to be converted into biosugar. Due to complex structure of the lignocellulosic component, pretreatment is needed to allow the penetration of cellulase into cellulose. While several pretreatments were available to open up the lignocellulosic structure, hydrothermal pretreatment process was chosen as the effectiveness and environmental-friendly process. Earlier research using individual biomass in different pretreatment processes had proven great effect on conversion of glucose. In this study, a pretreatment process was tested on mixed biomass to adapt bulk amount of biomass produced daily. The aim is to achieve high cellulose content after hydrothermal treatment. Mixing ratio of oil palm biomass was 1:1:1 of 2.0 mm size that involved empty fruit bunch, mesocarp fibre and frond fiber, and then continued to hydrothermal pretreatment with different severity factors (log, R_0) of 2.48 until 5.14. Chemical composition of untreated and pretreated mixed oil palm biomass was determined using acid hydrolysis. Each sample was examined with scanning electron microscope, wide-angle x-ray diffraction, and Brunauer-Emmett-Teller surface area analyses to check on the structure of biomass after pretreatment. High cellulose content which $50.1 \pm 0.3\%$ was successfully achieved at temperature of 190°C in 10 min. In conclusion, this experiment succeeded to approve that by hydrothermal pretreatment can give high cellulose content in mixed oil palm biomass under low temperature and short time.

Keywords: Oil palm biomass, pretreatment, hot compressed water, glucose, enzymatic hydrolysis