Teerayut Khunrong 2008: Optimization of Delignification and Enzyme Hydrolysis of Steam Exploded Oil Palm Trunk for Ethanol Production. Master of Science (Chemistry), Major Field: Chemistry, Department of Chemistry. Thesis Advisor: Associate Professor Vittaya Punsuvon, Ph.D. 117 pages.

Oil palm trunk chip, pretreated by steam explosion under selected condition, was used as a substrate for enzymatic hydrolysis. Response surface methodology (RSM) was used for optimization of delignification and hydrolysis processes. In delignification by NaOH and KOH, RSM was optimized according to the concentration of pulp, the concentration of alkaline base, reaction time and temperature. For enzyme hydrolysis, RSM was optimized according to temperature, hydrolysis duration, enzyme concentration and the concentration of pulp. Under these various delignification and hydrolysis conditions, the yield of glucose, alpha cellulose, removed lignin were determined. Comparative results with and without a delignification step, influenced on hydrolysis process, were presented. The optimum condition for NaOH and KOH delignification was 11%, 12% w/v of pulp concentration, 21.5%, 23.5% w/w of alkaline base concentration , 65 min reaction time, 78 ^{0}C, 80^{0}C temperature, respectively. These conditions gave 47.5% and 48% of glucose remaining in pulp after NaOH and KOH delignification, respectively. The optimum conditions for enzymatic hydrolysis of pulp obtained after NaOH and KOH delignification were 54, 65 FPU/g enzyme concentration, 50 h, 60 h hydrolysis duration, both 50 ^{0}C of temperature, and 2.5% pulp concentration, respectively. These conditions gave 85% of glucose yield for NaOH and 81% for KOH delignification. The hydrolysis process with delignification gave higher glucose yield than the hydrolysis process without delignification. The fermentation of 50 g/l glucose from enzyme hydrolysis gave maximum ethanol yield about 65%. Moreover, it was found that the alkaline delignification process prior to ethanol fermentation had no significant influence on the ethanol yield.

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