

Isaree Rodtusana 2007: Pretreatment of Waste Paper Sludge for Ethanol Production by Enzymatic Saccharification and Fermentation. Master of Engineering (Environmental Engineering), Major Field: Environmental Engineering, Department of Environmental Engineering. Thesis Advisor: Assistant Professor Monthon Thanuttamavong, Ph.D. 156 pages.

Waste paper sludge (WPS) is a lignocellulose biomass that consists of 51% cellulose, 39% hemicellulose and 7% lignin on dry solid basis which should be potentially used for ethanol production. To produce ethanol from WPS was initially pretreated in order to improve efficiency. The optimum conditions for dilute acid pretreatment was 2% H<sub>2</sub>SO<sub>4</sub> at 120°C for 60 minutes and enzymatic saccharification (pH 5.5, 50°C, 10 h) using cellulase enzyme, the reducing sugar concentration obtained was 76.05 mg/g WPS and then fermented by yeast *Saccharomyces cerevisiae*. The results that the ethanol yield was 21.50 mg/g WPS, maximum rate of ethanol production after fermented 60 h and fermentation efficiency 70.59%, when detoxification of the dilute acid pretreatment by overliming use Ca(OH)<sub>2</sub> increased the ethanol yield 27.55 mg/g WPS, maximum rate of ethanol production after fermented 40 h and fermentation efficiency 88.24%, so overlime increased the ethanol yield and decreased the fermentation time from 60 to 40 h.

The optimum conditions for ozone was used flow air into ozone generator 4 l/min contact time 45 minutes (pH 10.0) and enzymatic saccharification (pH 5.5, 50°C, 10 h) using cellulase enzyme, the reducing sugar concentration obtained was 54.7 mg/g WPS and then fermented by yeast *S. cerevisiae*. The results that the ethanol yield was 19.6 mg/g WPS, maximum rate of ethanol production after fermented 40 h and fermentation efficiency 90.59%.

---

Student's signature

---

Thesis Advisor's signature

/ /

