

Juthatip Sangkhatim 2011: Utilization of Waste from a Canned Fruit Mill to Produce Hydrogen. Master of Science (Environmental Technology and Management), Major Field: Environmental Technology and Management, Department of Environmental Science. Thesis Advisor: Assistant Professor Prapaipid Chairattanamanokorn, D.Eng. 104 pages.

Hydrogen is an effective renewable fuel because of high heating value and no greenhouse gases emission after burning. In this study, hydrogen was produced from pineapple waste taken from juice production. Pineapple waste is lignocellulose that can be utilized as a substrate for hydrogen production. Pretreatment of the waste could enhance efficiency of hydrogen production. Lignin and hemicellulose are dissolved and structures of the lignocellulose are swollen. Consequently, cellulase could be easily penetrated to cellulose during hydrolysis process. The objective of this study is to optimize pretreatment sludge conditions for hydrogen production and to optimize steam explosion condition to pretreat the waste by response surface methodology (RSM) prior to anaerobic fermentation at initial pH 5.5 and 35°C for hydrogen production. From the study of pretreatment sludge, the fermentation of sludge pretreated with NaOH at room temperature gave the highest cumulative hydrogen production. From the study of the steam explosion in pressure and time, the explosion of the pineapple at pressure 5 bar for 1 minute was optimal. Additionally, pineapple soaked in NaOH at concentration of 3% before steam explosion enhanced the cumulative hydrogen production (2254.62 ml/L). From the study of cellulase activity and time of hydrolysis, the fermentation of the raw pineapple waste hydrolyzed with cellulase 5 FPU/g substrate for 24 hr gave the highest cumulative hydrogen production. Subsequently, the optimization of the pretreatment condition was investigated by response surface methodology (RSM) by 3 factors (steam pressure and time of steam explosion and concentration of NaOH). The optimal pretreatment of the pineapple waste was previous immersion with NaOH at concentration of 2.99% and steam explosion at 7.72 bar for 1 min 10.8 second providing the highest cumulative hydrogen production at 2446.98 ml/L.

---

Student's signature

Thesis Advisor's signature