

Papangkorn Kaewpongsaton 2012: Optimal Pretreatment of Sawdust and Microorganism for Hydrogen Production. Master of Science (Environmental Technology and Management), Major Field: Environmental Technology and Management, Department of Environmental Technology and Management.
Thesis Advisor: Assistant Professor Prapaipid Chairattananamokorn, D.Eng.
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The objective of this research is to study the optimum condition of pretreatments of sawdust and microorganism in seed sludge for hydrogen production by anaerobic fermentation at 55 °C and pH 5.5. Firstly, screening of factors of the sawdust pretreatment significantly influencing to hydrogen production was conducted by Plackett-Berman experimental design. The cellulase activity for the hydrolysis of the sawdust was a significant factor. Thereafter, the optimum pretreatment condition was investigated with Taguchi and Response Surface Method experimental design. The fermentation of sawdust pretreated by soaking in sulfuric acid solution at concentration of 1.75% at 60 °C for 3 hr, exploding with steam at 10 bar for 10 min and hydrolyzing with cellulase at 10 FPU/g for 15 hr provided the highest hydrogen production yield at 215.77 ml/g. The fermentation of the pretreated sawdust with sludge, pretreated under optimum condition by adjusting pH of the seed sludge at pH 2.0 and soaking in hot water at 100 °C for 1 hr, provided the highest hydrogen production yield at 264.68 ml/g. From molecular biology analysis, *Thermoanaerobacterium* species was dominant in the seed sludge both before and after the fermentation. Furthermore, the optimum condition fermentation of pretreated sawdust and seed sludge at C:N ratio at 60 with Fe^{2+} , Ca^{2+} , Mg^{2+} and Zn^{2+} at the concentration of 200 mg/L, 150 mg/L, 100 mg/L and 0.5 mg/L, respectively provided the maximum hydrogen yield at 275.77 ml/g. This study indicates that the pretreatment of sawdust and seed sludge could enhance hydrogen production.

Student's signature

Thesis Advisor's signature