

Songpon Samanpiboonphol 2014: Biohydrogen Production from Bio-oil using Steam Reforming, Autothermal Reforming and Water-gas Shift Reactions. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Associate Professor Apinya Duangchan, Ph.D. 97 pages.

This work studied hydrogen production from aqueous phase of bio-oil by steam reforming, autothermal reforming, and water gas shift reactions. Production of hydrogen via catalytic steam reforming by using Cu-Ni-Sn/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> was investigated. Bio-oil produced by pyrolysis of corn cob was separated into two phases: aqueous phase and organic phase. The aqueous phase and steam were fed continuously into a reactor. The steam to carbon mole ratio (S/C) was 10:1, the air flow rate was 200 cm<sup>3</sup>/min and the reactor was operated at 750°C. Prior to using bio-oil, ethanol was used as a model compound. The hydrogen yields were 81.0, 55.1%, 55.6% and 70.0%, using non catalyst,  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, Cu-Ni/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> and Cu-Ni-Sn/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, respectively. The results demonstrated that the highest hydrogen gas produced was from Cu-Ni-Sn/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> catalyst. Then the bio-oil aqueous phase was used to produce hydrogen gas via Cu-Ni-Sn/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> catalyst. The operating temperature was varied from 185-850°C and the steam to carbon mole ratio (S/C) was varied from 7.5:1-10.5:1. From the results, the optimum conditions of this work were, the air flow rate of 200 cm<sup>3</sup>/min, the steam to carbon mole ratio (S/C) of 10.5:1 and the temperature of 230°C. The highest hydrogen gas yield was 90.8%.

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Thesis Advisor's signature