

Wenika Suwannasing 2014: Upgrading of Bio-oil from Corn Cob for Animal Feed over Ni-Co/SBA-15 Catalyst and Effect of Extracted Chemical on Upgraded Bio-oil. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Associate Professor Apinya Duangchan, Ph.D. 100 pages.

This work studied upgrading of bio-oil obtained from corn cob via hydrogenation reaction. SBA-15 was synthesized and used as a catalyst. The organic phase and aqueous phase of the bio-oil were separated and remixed at a ratio of 3:7 by volume to represent total bio-oil. Upgrading of the bio-oil was performed in a 70 ml batch reactor at 300°C, initial hydrogen pressure of 1 atm and reaction time of 1 h. Compared with the raw bio-oil, the results of catalytic upgrading of the bio-oil, using SBA-15 catalyst showed slightly increase of the heating values of both organic and aqueous phases from 25.45 to 26.20 and 1.61 to 1.73 MJ/kg, respectively. In this work effect of bi metal, Co and Ni, loading with Co:Ni molar ratio of 1:1 over SBA-15 on bio-oil upgrading was investigated. Ni-Co/SBA-15 catalyst increased heating values of both phases to 28.14 and 1.87 MJ/kg, respectively. Three solvents, n-pentane, toluene and methanol, were used to extract the organic phase of the raw bio-oil to produce the n-pentane, toluene and methanol fractions, respectively. After removing the solvent, each fraction was upgraded by Ni-Co/SBA-15 catalyst and the organic portion of the liquid product was analyzed by GC-MS and bomb calorimeter. The heating values of the n-pentane fraction, toluene fraction and methanol fraction were 34.67, 33.88 and 32.41 MJ/kg, respectively. The n-pentane fraction showed the highest H/C ratio of 1.736 and the increase of aliphatic hydrocarbons by 53.9% but lower in phenol group by 14.9% compared with the raw organic bio-oil.

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