

Woraphan Larpyutithum 2014: Upgrading of Bio-oil from Spent Coffee Grounds Using CoMo/MCM-41 and CoMo/Al₂O₃ Catalysts. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Associate Professor Apinya Duangchan, Ph.D. 124 pages.

In this study, bio-oil was produced by fast pyrolysis of spent coffee grounds at 550°C, the liquid product from pyrolysis was distilled into two fractions at 200°C, then the heavy fraction (>200°C) was upgraded by using a mixture of CoMo/MCM-41 and CoMo/Al₂O₃ in an autoclave reactor. The separation of light oil from heavy oil by distillation before upgrading by using the mixed catalysts increased the heating value of heavy oil from 35.58 (from upgrading of the total bio-oil) to 37.05 MJ/kg. In addition, upgrading of heavy oil by using the mixed catalysts and decalin increased the heating value, and the maximum heating value of the heavy fraction was 41.83 MJ/kg at 400°C, initial hydrogen pressure of 2 atm, the 1:3 weight ratio of CoMo/MCM-41 and CoMo/Al₂O₃ catalysts for 1 h of reaction time. The upgraded heavy oil was analyzed by GC-MS. The result showed that the upgrading by using the mixed catalysts converted some chemicals, such as acids, esters, phenols, and naphthalenes to benzene-xylene-toluene compounds. The elemental analysis results showed oxygen and nitrogen contents decreased by 39% and 14%, respectively.

Student's signature

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