Hydrodeoxygenation of bio-tar over activated charcoal supported Mg-Ni-Mo catalyst in supercritical ethanol

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Nowadays, fast pyrolysis of lignocellulosic biomass is a promising method to produce liquid-phase fuel. However the products such as bio-oil and bio-tar obtained from the biomass fast pyrolysis has much lower heating value than the conventional fuels such as crude oil and diesel. Common upgrading methods to increase their heating value is hydrotreatments such as hydrodeoxigenation (HDO). In this study, activated charcoal supported Mg-Ni-Mo catalyst was used for HDO reaction of bio-tar in supercritical ethanol in batch reactors. The effect of initial hydrogen pressure ranging from 20 to 80 bars and reaction temperature of 250-350 °C were investigated on the product distribution, elemental composition and heating value of liquid products, and the composition of gaseous products. Characterization of the fresh and spent catalysts was also carried out via XRD and BET surface area measurements to understand the variation in the catalyst during the HDO reaction. GC-MS analysis results showed phenolic compounds as major compounds. Product yields were 3 %, 70 %, and 15-25 % for solid, oil, and gas, respectively.