

Analysis of Bio-Oil Produced by Pyrolysis of Coconut Shell

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Abstract : The utilization of biomass as a source of new and renewable energy is being carried out. One of the technologies to convert biomass as an energy source is pyrolysis which is converting biomass into more valuable products, such as bio-oil. Bio-oil is a liquid which is produced by steam condensation process from the pyrolysis of coconut shells. The composition of a coconut shell e.g. hemicellulose, cellulose and lignin will be oxidized to phenolic compounds as the main component of the bio-oil. The phenolic compounds in bio-oil are corrosive; they cause various difficulties in the combustion system because of a high viscosity, low calorific value, corrosiveness, and instability. Phenolic compounds are very valuable components which phenol has used as the main component for the manufacture of antiseptic, disinfectant (known as Lysol) and deodorizer. The experiments typically occurred at the atmospheric pressure in a pyrolysis reactor at temperatures ranging from 300 ^oC to 350 ^oC with a heating rate of 10 ^oC/min and a holding time of 1 hour at the pyrolysis temperature. The Gas Chromatography-Mass Spectroscopy (GC-MS) was used to analyze the bio-oil components. The obtained bio-oil has the viscosity of 1.46 cP, the density of 1.50 g/cm³, the calorific value of 16.9 MJ/kg, and the molecular weight of 1996.64. By GC-MS, the analysis of bio-oil showed that it contained phenol (40.01%), ethyl ester (37.60%), 2-methoxy-phenol (7.02%), furfural (5.45%), formic acid (4.02%), 1-hydroxy-2-butanone (3.89%), and 3-methyl-1,2-cyclopentanedione (2.01%).

Keywords : bio-oil, pyrolysis, coconut shell, phenol, gas chromatography-mass spectroscopy

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