

Gasification of Bio-Oil in Supercritical Water

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Bio-oil is a liquid-phase product formed by fast pyrolysis of lignocellulosic biomass. Bio-oil can be converted to combustible syngas by steam reforming, liquid-water reforming, or supercritical water reforming process. In this work, reforming of bio-oil in supercritical water was carried out to produce clean syngas without any solid particles. Effect of reaction temperature (500–700 °C), catalyst (activated charcoal, Ni-Y/AC), initial bio-oil concentration on the product distribution was investigated in a packed-bed reactor. Bio-oil feedstock was obtained by fast pyrolysis of sawdust in a bench-scale reactor operated at about 500 °C. Char was formed by coking reaction of organic compound in bio-oil especially in the entrance region of the tubular reactor and a modification of the reactor to solve the problem was proposed. Syngas product formed by SCWG of bio-oil was very clean with heating values of 4,000 kcal/Nm³, which are high compared with the heating values of syngas formed by partial oxidation of wood. The syngas can be used as a fuel for distributed power generation using fuel cell system.