

Bio-Crude-Oil from Fluidized Bed Pyrolysis of Rice Straw and its Characterization

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Abstract

Rice is grown abundantly in all of the South Asian countries. About 130 wt% of net rice production is generated as biomass solid waste in the form of rice straw. The biomass solid waste has been characterized to investigate its suitability as feedstock for thermochemical conversion. Considering this availability of rice straw, its favorable volatile content, and elemental and thermal characteristic, an attempt has been made to convert the solid waste into bio-oil. The solid rice straw in particle form was pyrolysed in an externally heated 1443 cm³ volume fluidized bed reactor with nitrogen as the fluidizing gas and silica sand as the bed material. A renewable energy biomass source cylindrical heater and a gravity feed type reactor feeder were used to heat and to feed the reactor, respectively. The pyrolytic products were oil, char and gas. The product yields were found to be significantly influenced by the process conditions. The physical properties, calorific value, elemental (CHONS) analysis and chemical composition using Fourier Transform InfraRed spectroscopy (FTIR) of the product oil were determined. The oil obtained at maximum liquid yield condition was considered for these analyses. The optimum reaction condition was at 450° C reactor bed temperature and 31 l/min fluidizing gas flow rate. The results of the analyses showed that the oil was highly oxygenated, acidic in nature with moderate heat value and favorable pour and flash points.

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