

Conversion of oil palm trunk into bio-oil via treatment with subcritical water

ABSTRACT

Subcritical water was applied to produce bio-oil from a 21-year-old abandoned oil palm trunk (OPT). The effects of reaction temperature, time, part of trunk taken, and optimum reaction condition were investigated. Higher heating values (HHVs), CHNS/O elemental and GC-MS analysis were performed to characterize the bio-oil. The subcritical water temperatures were manipulated between 100 °C and 370 °C with 10 °C intervals and the reaction time was varied between 6 s and 20 min. The maximum yield of bio-oil from subcritical water treatment of top and bottom part of OPT was 0.27 and 0.30 kg/kg-dry OPT, respectively. The optimum reaction time and temperature was 5 min and 330 °C. The highest HHV of the bio-oils derived from the top and bottom part of OPT was 33.2 MJ/kg and 26.4 MJ/kg, respectively. From GC-MS measurement, the bio-oil contained phenolic compounds. The bio-oil derived from OPT obtained from subcritical water treatment had high HHV and comparable to other liquid fuels.

Keyword: Subcritical water treatment; Oil palm trunk; Bio-oil; Heating value