

ABSTRACT:

Effect of alkalis (NaOH, KOH and K₂CO₃) on liquefaction of EPFB (empty palm fruit bunch) biomass liquefaction was investigated under subcritical water conditions in a batch reactor operating at 270 °C and 20 bars for a period of 20 min. Catalytic performance and suitable biomass to water ratio that supported higher EPFB conversion, liquid hydrocarbons yield and lignin degradations were screened. Analytical results indicate that maximum of 68 wt% liquids were produced along with 72.4 wt% EPFB mass conversions and 65.6 wt% lignin degradation under 1.0 M K₂CO₃/2:10 (biomass/water) conditions. In comparison, the experiments that were performed in the absence of alkalis yielded only 30.4 wt% liquids, converted 36 wt% EPFB and degraded 24.3 wt% lignin. Furthermore, biomass to water ratios >2:10 decreased both solid mass conversion and liquid hydrocarbons' yield. The reactivity of the alkalis was in the order of K₂CO₃ > KOH > NaOH. The liquid compositions were dominantly phenols and esters; the highest value of phenol (60.1 wt% of liquid yield) was achieved in the case of K₂CO₃ (1.0 M) with 5 g EPFB/25 ml water ratio while 1.0 M NaOH yielded maximum esters (86.4 wt% of liquid yield). The alkali promoted process assisted with hotwater treatments seemed promising for production of bio-oils from EPFB.