

Catalytic hydrothermal liquefaction of empty fruit bunch in subcritical water over bimetallic modified zeolite

ABSTRACT

Catalytic hydrothermal liquefaction of empty fruit bunch (EFB) with no added H₂ effectively produces biomass derived fuel or known as bio-oil. In this study, a bimetallic modified zeolite (BaNi, BaLa and BaCe/CHZSM5) catalyst with a series of dosage ratio (1:1, 1:2 and 2:1) was used for the EFB conversion to bio-oil. Ni, La and Ce addition to the Ba/CHZSM5 showed significant changes on the physicochemical properties of catalysts and exhibited enhanced catalytic performance. The activity-structure correlation revealed that EFB conversion and bio-oil yield were favoured on bimetallic modified CHZSM5 and the most effective catalyst was Ba₁La₂/CHZSM5. Brunauer–Emmett–Teller (BET) surface area measurement and temperature programmed desorption of ammonia (TPD-NH₃) results confirmed that high surface area and rich acidic sites of Ba₁La₂/CHZSM5 catalyst eventually enhanced the catalytic activity in HTL of EFB. Comparing to other bimetallic modified catalyst, the desirable aromatic and aliphatic hydrocarbon also predominated over Ba₁La₂/CHZSM5 catalysed reaction which demonstrated that this catalyst have a good ability in produce high quality of bio-oil with less oxygenated compounds.