Production of renewable diesel from Jatropha curcas oil via pyrolytic-deoxygenation over various multi-wall carbon nanotube-based catalysts

ABSTRACT

Jatropha curcas is a highly toxic plant that produces seed containing viscous oil with productivity (2 ton/ha), it grows in tropical and sub-tropical regions and offer greater adaptability to a wide range of climatic and soil conditions. Its oils have been noted as an important alternative to produce green diesel via deoxygenation reaction. This study, deoxygenation of *jatropha curcas* oil (JCO) was carried out over NiO–Fe_2O_3 and NiO–ZnO catalysts that supported onto multi-walled carbon nanotube (MWCNT). It had found that high Fe and Zn dosages were ineffective in deoxygenation and greatest activity was observed on $NiO_{(20)}$ $Fe_2O_{3(5)}$/MWCNT catalyst. Structure-activity correlations revealed that low metal loading, large density of weak + medium acidic sites and strong basic sites play key role in enhancing the catalytic activities and *n*-(C_{15}+C_{17}) selectivity. Comparing carbon nanostructures and carbon micron size supported NiO-Fe_2O_3 revealed that green diesel obtained from NiO–Fe_2O_3/MWCNT catalysed deoxygenation had the highest heating value and the lowest amounts of oxygen content. Thereby, it confirmed the importance of carbon nanostructure as the catalyst support in improving the diesel quality. Considering the high reusability of NiO-Fe_2O_3/MWCNT (6 consecutive runs) and superior green diesel properties (flash point, cloud properties and cetane index) demonstrated the NiO–Fe_2O_3/MWCNT catalyst offers great option in producing excellent properties of green diesel for energy sector.

Keyword: Carbon; Deoxygenation; Iron; Multiwall carbon nanotube; Nickel