Effect of Ni/Malaysian dolomite catalyst synthesis technique on deoxygenation reaction activity of waste cooking oil

ABSTRACT

Local carbonate mineral, Malaysian dolomite has the potential as a deoxygenation catalyst due to its high capacity of CaO–MgO which enhances oxygen compound removal and produces high-quality green fuel with desirable lighter hydrocarbon. In this work, the performance of Ni-doped-calcined Malaysian dolomite (Ni/CMD900) catalyst with different catalyst synthesis techniques (precipitation, impregnation, and co-precipitation) were compared on the deoxygenation of waste cooking oil (WCO) process for green fuel production. The physicochemical properties of the synthesized catalyst were investigated by X-ray diffraction, Brunauer-Emmette-Teller surface area, temperature-programmed desorption of carbon dioxide, X-ray fluorescence, scanning emission microscopy and transmission electron microscopy analysis while the liquid products were analyzed by gas chromatography-mass spectroscopy and Fourier-transform infrared spectroscopy. Evidently from the result of the observation, the preparation technique plays an important role in determining the physicochemical properties of the catalyst for deoxygenation reaction of WCO in which precipitation technique outperformed other methods. Synthesized Ni-Malaysian dolomite-based catalyst, PRE/Ni/CMD900 catalyst was found to be superior in deoxygenation reaction activity as compared to other catalysts with high conversion of WCO (68.0%), high yield of pyrolysis oil (36.4%), and less coke formation (32.0%).

Keyword: Deoxygenation; Dolomite; Renewable fuel; Pyrolysis; Waste cooking oil