

Preparation and Characterization of Modified ZnO Incorporated into Mesoporous MCM-22 Catalysts and Their Catalytic Performances of Crude Jatropha Oil to Biodiesel

Authors : Bashir Abubakar Abdulkadir, Anita Ramli, Lim Jun Wei, Yoshimitsu Uemura

Abstract : In this study, the ZnO/MCM-22 catalyst with different ZnO loading were prepared using conventional wet impregnation process and the catalyst activity was tested for biodiesel production from Jatropha oil. The effects of reaction parameters with regards to catalyst activity were investigated. The synthesized catalysts samples were then characterized by X-ray diffraction (XRD) for crystal phase, Brunauer-Emmett-Teller (BET) for surface area, pore volume and pore size, Field Emission Scanning electron microscope attached to energy dispersive x-ray (FESEM/EDX) for morphology and elemental composition and TPD (NH₃ and CO₂) for basic and acidic properties of the catalyst. The XRD spectra couple with the EDX result shows the presence of ZnO in the catalyst confirming the positive intercalation of the metal oxide into the mesoporous MCM-22. The synthesized catalyst was confirmed to be mesoporous according to BET findings. Also, the catalysts can be considered as a bifunctional catalyst based on TPD outcomes. Transesterification results showed that the synthesized catalyst was highly efficient and effective to be used for biodiesel production from low grade oil such as Jatropha oil and other industrial application where the high fatty acid methyl ester (FAMES) yield was achieved at moderate reaction conditions. It was also discovered that the catalyst can be used more than five (5) runs with little deactivation confirming the catalyst to be highly active and stable to the heat of reaction.

Keywords : MCM-22, synthesis, transesterification, ZnO

Conference Title : ICBBT 2017 : International Conference on Biofuels and Bioenergy Technologies

Conference Location : Kuala Lumpur, Malaysia

Conference Dates : December 11-12, 2017