

Pyrolytic-deoxygenation of triglycerides model compound and non-edibleoil to hydrocarbons over SiO₂-Al₂O₃ supported NiO-CaO catalysts

ABSTRACT

Catalytic deoxygenation (DO) of triglycerides-based feeds to diesel-like fuel was investigated over NiO-CaO/SiO₂-Al₂O₃ and NiO/SiO₂-Al₂O₃ catalysts using semi-batch reactor under partial vacuum and inert N₂ flow. The results showed that the bi-functional catalyst exhibited the highest DO activity with product selectivity toward diesel-like fuel n-(C₁₃-C₂₀). The catalytic process appeared to inhibit the occurrence of side reactions via neutralization of the strong acid sites. On the other hand, DO reaction under inert N₂ flow has improved the deoxygenated product, which demonstrate that N₂ flow condition has effectively removed the decarboxylation/decarbonylation gasses (CO₂/CO) from poisoning the catalyst active sites. The high concentration of strong basic-acid sites of the catalyst is the main reason for increased CC cleavage pathway, while milder acidic sites responsible for CO cleavage pathway. High degree of unsaturated fatty acid in the feedstock has affected adversely the DO of triglycerides by accelerating the catalyst deactivation. The N₂ flow condition, degree of unsaturated fatty acid in the feedstocks, acidity and basicity of the catalysts are important factors to improve DO activity as well as product selectivity.

Keyword: Deoxygenation; CaO; NiO; Silica-alumina; Decarboxylation/decarbonylation; Free fatty acid