

## Synthesis and Characterization of a $\text{CaFe}_2\text{O}_4$ Catalyst for Oleic Acid Esterification

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### ABSTRACT

Esterification of free fatty acid (oleic acid) with ethanol over a calcium ferrite catalyst was investigated in the present study. The calcium ferrite catalyst ( $\text{CaFe}_2\text{O}_4$ ) was synthesized by the sol-gel method, which exhibited high catalytic activity for esterification of oleic acid. The morphology and size (500–1000 nm) of the synthesized catalyst were observed by scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDS) was used to ensure the absence of impurities. The orthorhombic structure of calcium ferrite was exposed by X-ray diffractometry (XRD). The effects of reaction variables such as catalyst loading, methanol to acid ratio, reaction time and temperature on the conversion of fatty acids were studied. The optimum conditions for the esterification process was a molar ratio of alcohol to oleic acid at 12 : 1 with 5 wt% of  $\text{CaFe}_2\text{O}_4$  at 70 °C with a reaction time of 2 h. XRD patterns of the recycled catalyst evidenced that the catalyst structure was unchanged up to the 3<sup>rd</sup> cycle, which indicated the long life of the catalyst.

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