Catalytic Neutralization of Naphthenic Acid from Petroleum Crude Oil by Using Cerium Oxide Catalyst and 2- Methylimidazole in Polyethylene Glycol

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ABSTRACT

The presence of relatively high naphthenic acid in crude oil may contribute to the major corrosion in oil pipelines and distillation units in crude oil refineries. Thus, high concentration naphthenic acid crude oil is considered to be of low quality and is marketed at lower prices. In order to overcome this problem, the neutralization method had been developed to reduce the TAN value in crude oil. In this study, crude oil from Petronas Penapisan Melaka was investigated. Methods: The parameters studied were reagent concentration, catalyst loading, calcination temperature, and reusability of the potential catalyst. The basic chemical used was 2-methylimidazole in polyethylene glycol (PEG 600) with concentration 100, 500 and 1000 ppm. Cerium oxide-based catalysts were supported onto alumina prepared with different calcination temperatures. Results: The catalyst was characterized by using Brunauer-Emmett-Teller (BET), Fourier Transform Infrared Spectroscopy (FTIR) and Thermogravimetry Analysis-Differential Thermal Gravity (TGA-DTG) to study the physical properties of the catalyst. The Ce/Al2O3 catalyst calcined at 1000°C was the best catalyst due to larger surface area formation which lead to an increment of active sites thus will boost catalytic activity. The result showed that the Ce/Al2O3 catalyst meets the Petronas requirement as the TAN value reduced to 0.6 mgKOH/g from the original TAN value of 4.22 mgKOH/g. Conclusion: The best reduction of TAN was achieved by using catalyst loading of 0.39% and reagent of 1000 ppm.

KEYWORDS

Catalyst; Crude oil; Naphthenic acids; Neutralization; Petroleum; Total acid number

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