CATALYTIC NEUTRALIZATION OF ACIDIC CRUDE OIL UTILIZING 2-METHYLIMIDAZOLE IN POLYETHYLENE GLYCOL WITH THE AID OF Ca/Al_2O_3 CATALYST

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ABSTRACT

CATALYTIC NEUTRALIZATION OF ACIDIC CRUDE OIL UTILIZING 2-METHYLIMIDAZOLE IN POLYETHYLENE GLYCOL WITH THE AID OF Ca/Al_2O_3 CATALYST

The Naphthenic Acid (NA) found in the acidic crude oil can leads to corrosion problem in oil refinery equipment and reduces the performances of the oil. Various methods can be used to reduce the NAs concentration such as dilution, catalytic decarboxylation and caustic washing but all these methods have its own weakness. In this study, catalytic neutralization reaction was done in order to lowering the Total Acid Number (TAN) in crude oil to below than one mg KOH/g utilizing 2-Methylimidazole in Polyethylene Glycol (PEG400) with aid of Ca/Al_2O_3 catalyst. The catalyst were supported on the alumina through Incipient Wetness Impregnation (IWI) methods and calcined at calcination temperatures of 800, 900 and 1000^oC. The potential catalyst was characterized by using Fourier Transform Infrared Spectroscopy (FTIR), Thermogravimetry Analysis (TGA), X-ray Diffraction Spectroscopy (XRD), and Brunauer-Emmett-Teller (BET) for its physical and chemical characteristics. The result showed that Ca/Al_2O_3 catalyst successfully reduced to 0.52 mg KOH/g from original TAN value 4.22 mg KOH/g by using a catalyst with calcination temperature 1000^oC, 0.39% (7 beads) of catalyst loading and 1000 ppm of 2-Methylimidazole in PEG. The FTIR results showed that the C-H stretching of catalyst after reaction might come from alkane and alkene group of long chain acids which has bounded to the catalyst surface around 2321.25 cm^{-1}. For TGA results, the total weight loss of the Ca/Al_2O_3 32.6% due to complete removal of the impurities and water in the catalyst. For XRD showed, $CaAl_4O_7$ species was identified as the active sites for the catalyst calcined at 1000^oC. BET analysis showed the Ca/Al_2O_3 catalyst calcined at 800^oC gave the highest surface area of 120.03 m^2/g compared to the catalyst calcined at 900^oC and 1000^oC that allows more molecular NAs to enter pores of the catalyst. In conclusion, a catalytic neutralization method was efficient in reducing NA from acidic crude oil thus the TAN value was successfully reduced to below than 1 mg KOH/g.