Maythinee Sirikulbodee 2007: Biodiesel Production from Crude Palm Oil using K_2CO_3/CaO as Heterogeneous Catalyst. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Assistant Professor Kandis Sudsakorn, Ph.D. 87 pages.

At present, alternative fuels for diesel engines are becoming more important due to limited resource of fossil fuel, increasing price of crude oil and also environmental concerns. Biodiesel can be a substitute for conventional diesel due to its comparable fuel properties and cleaner emission. In this study, transesterification of crude palm oil with methanol was catalyzed by heterogeneous catalyst, K_2CO_3/CaO and the optimum condition for biodiesel production was investigated. The catalyst was prepared by incipient wetness impregnation having different loadings of K_2CO_3 (5, 15, 25 and 35 wt%) and used without calcination. The catalysts were characterized by XRD, XRF, N_2 Physisorption and DTA/TGA. Transesterification was studied 6:1, 12:1, 18:1, 26:1 and 33:1 methanol to oil molar ratio, reaction time of 2, 3 and 5 h and catalyst amount of 2, 4, 6 and 9 wt%. The highest of methyl ester content and yield were obtained as 96 and 81 %, respectively, with the 35 wt% K_2CO_3/CaO catalyst. The optimum condition was found to be 60 ^{O}C, 3h, 26:1 methanol to oil molar ratio, 6 wt% catalyst amount, 20 wt% THF and 300 rpm stirring speed. The methyl ester properties including flash point, pour point, cloud point, viscosity and density were determined and found to be comparable to the standard values. Furthermore, a comparison of catalytic activities of K_2CO_3/CaO and others including K_2CO_3/Al_2O_3 and KNO_3/Al_2O_3 confirmed that K_2CO_3/CaO show to be most active due to the highest basicity of K_2CO_3 and higher transesterification activity of CaO compared to Al_2O_3. Finally K_2CO_3/CaO without calcination was shown to behave partly like a homogeneous catalyst. However, it could be completely regenerated to have activity similar to a fresh catalyst without calcination- a step where a large amount of energy was consumed.

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