

Preparation and characterization of modified calcium oxide from natural sources and their application in the transesterification of palm oil

ABSTRACT

Calcium oxide catalysts were prepared from natural calcium sources such as limestone and mud creeper shell and the catalytic activities were evaluated in the transesterification of palm oil. The raw material which mainly composed of calcium carbonate can be easily converted to calcium oxide (CaO) after calcination above 1000 K for few hours. Abundant, cheap sources, benign, high conversion and nontoxic become main advantages of these catalysts. The catalysts were characterized by XRF, TGA, XRD, CO₂-TPD, SEM, and BET methods. Thermal decomposition of CaCO₃, will produced CaO which later will be converted into calcium hydroxide (Ca(OH)₂) via simple hydration technique. Under optimum reaction condition (methanol to oil ratio 15:1, catalyst loading 3 wt.%, reaction temperature 338 K for 5 hours), the highest conversion of palm oil to methyl ester recorded were 98% and 94% when using modified limestone and mud creeper shell respectively. The results observed an increment up to 80% by using modified catalysts with characterization results showed high in basicity and surface area. Hence, promising materials via simple and cheap method can be achieved.

Keyword: Biodiesel production; Calcium hydroxide; Heterogeneous; Hydrolysis; Limestone; Methyl ester; Mud creeper shell; Palm oil