Synthesis and catalytic activity of hydrationdehydration treated clamshell derived CaO for biodiesel production

ABSTRACT

Biodiesel has gained interest of most researchers recently as an alternative for fossil diesel fuels in promoting environmentally sustainable fuels. With the presence of base catalyst, biodiesel can be easily produced via transesterification of triglyceride with alcohol under mild reaction conditions. Utilization of green catalysts from natural waste shells for biodiesel synthesis is capable of reducing the cost of catalyst which is beneficial to overall production cost. In this study, we have developed a modified CaO catalyst from natural waste clamshell (Meretrix meretrix) via hydration–dehydration treatment for transesterification process. The effects of hydration duration on clamshell were investigated to achieve the most optimum characteristic and catalytic activity. The surface area and the basicity of the treated catalyst increased extensively with prolonged hydration duration technique. By prolonging the water treatment process, it shall allow more formation of Ca(OH)2 which then has promoted the formation of Bronsted base sites for higher basicity. The catalytic activity of hydration–dehydration treated catalysts were found increased in the following order CS-CaO12h > CS-CaO9h > CS-CaO6h > CS-CaO3h > CS-CaO1h. The triglyceride conversion was as high as 98% when utilizing CS-CaO12h under reflux conditions of methanol: oil molar ratio of 9:1, catalyst amount is 1 wt% and 2 h of reaction time.

Keyword: Biodiesel; Transesterification; Green-catalyst; Clamshell; Calcium oxide; Hydration technique