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Turritella terebra Shell Synthesized Calcium Oxide Catalyst for Biodiesel Production from Chicken Fat

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Abstract. Heterogeneous catalyst has been viewed as a promising catalyst for biodiesel production. This study employed *Turritella terebra* (TT) shell as a source for synthesizing heterogeneous CaO catalyst for biodiesel production via transesterification by utilizing chicken fat as a feedstock. The TT shell CaO catalyst was characterized and its catalytic performance was studied. The spectrographic methods that include FTIR, SEM, PSA, and BET-BJH were employed for characterization of the synthesized CaO. The TT shell CaO catalyst optimally produced chicken fat biodiesel (CFB) with reaction parameters at catalyst concentration of 4 wt%, chicken fat to methanol molar ratio of 1:12, reaction temperature of 60°C, and reaction time of 90 min. The optimal yield was 94.03% and the TT shell CaO catalyst still yield 79.19% of CFB on the fifth cycle of reaction. This study has implied that TT shell is a feasible and attractive renewable source of heterogeneous CaO catalyst for biodiesel production.

1. Introduction

In light of recent hike in crude oil price, biodiesel production has received a great demand all over the world. Global biodiesel production has continued to increase since 2012 despite the oil glut which dramatically decreased the crude oil price [1]. Asia produced 10.8% of global biofuels which include biodiesel and bioethanol with China as the highest contributing producer in Asia at 3.2% of global biofuels production [2]. Malaysia started the export of biodiesel since 2006 to countries in America, Asia and the European Union (EU) [3]. However, Malaysia ranked the first in term of absolute potential biodiesel production with an estimated potential production of 14,540 million liters of biodiesel [4].

Biodiesel competitiveness generally associated with its price difference with petroleum-derived diesel. Roughly ¾ of biodiesel's production cost came from its feedstocks which are mainly plant oil and methanol [5]. The competition between biodiesel purpose and edible oil market for plants oil which some researchers termed as "Food vs. Fuel" exacerbated the ability of biodiesel to be priced competitively against petro-diesel [6]–[9]. Researchers globally have studied the production of biodiesel from non-edible oils and fats as an alternative to the higher priced edible plants oil. Non-edible feedstocks can be categorized into waste fats and oils or energy crops. The former includes waste cooking oil (WCO), animal fats and grease while the later includes castor (*Ricinus*