

Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

# Bioresource Technology

journal homepage: [www.elsevier.com/locate/biortech](http://www.elsevier.com/locate/biortech)

## Biodiesel production via transesterification of palm olein using waste mud crab (*Scylla serrata*) shell as a heterogeneous catalyst

Peng-Lim Boey<sup>a</sup>, Gaanty Pragas Maniam<sup>a,\*</sup>, Shafida Abd Hamid<sup>b</sup><sup>a</sup> School of Chemical Sciences, Universiti Sains Malaysia, 11800 Minden, Penang, Malaysia<sup>b</sup> Kulliyah of Science, International Islamic University Malaysia, Jalan Istana, Bandar Indera Mahkota, 25200 Kuantan, Pahang, Malaysia

### ARTICLE INFO

#### Article history:

Received 3 June 2009

Received in revised form 15 July 2009

Accepted 16 July 2009

Available online 8 August 2009

#### Keywords:

Biodiesel

Heterogeneous catalyst

Transesterification

Methyl esters

Crab shell

### ABSTRACT

A recent rise in crab aquaculture activities has intensified the generation of waste shells. In the present study, the waste shells were utilized as a source of calcium oxide to transesterify palm olein into methyl esters (biodiesel). Characterization results revealed that the main component of the shell is calcium carbonate which transformed into calcium oxide when activated above 700 °C for 2 h. Parametric studies have been investigated and optimal conditions were found to be methanol/oil mass ratio, 0.5:1; catalyst amount, 5 wt.%; reaction temperature, 65 °C; and a stirring rate of 500 rpm. The waste catalyst performs equally well as laboratory CaO, thus creating another low-cost catalyst source for producing biodiesel. Reusability results confirmed that the prepared catalyst is able to be reemployed up to 11 times. Statistical analysis has been performed using a Central Composite Design to evaluate the contribution and performance of the parameters on biodiesel purity.

© 2009 Elsevier Ltd. All rights reserved.

\* Corresponding author. Tel.: +60 16 4110236; fax: +60 4 6574854.

E-mail address: [gaanty@hotmail.com](mailto:gaanty@hotmail.com) (G.P. Maniam).