Document details

Waste Management
Volume 78, August 2018, Pages 929-937

In situ transesterification of solid coconut waste in a packed bed reactor with CaO / PVA catalyst (Article)

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Abstract

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In this study, solid coconut waste and CaO / PVA was used as raw material and catalyst respectively to produce biodiesel through in situ transesterification . Both, raw material and catalyst were packed in a packed bed reactor . The reaction was fixed for 3 h and the mixing was kept constant at 350 rpm. The highest biodiesel yield of 95% was obtained at reaction temperature of 61 °C with catalyst loading (CaO / PVA) of 2.29 wt% and methanol to solid ratio of 12:1. CaO - waste derived catalyst has been successfully proven to be utilized as heterogeneous base catalyst for the production of biodiesel from solid coconut waste . © 2018 Elsevier Ltd

SciVal Topic Prominence

Topic: Biodiesel | Transesterification | oil molar

Prominence percentile: 99.884

Reaxys Database Information

View Compounds

Author keywords

Biodiesel | Eggshell | In situ transesterification | Polyvinyl alcohol | Solid coconut waste | Waste -derived catalyst

Indexed keywords

Engineering controlled terms: Biodiesel | Catalysts | Chemical reactors | Polyvinyl alcohols | Transesterification

Engineering uncontrolled terms: Catalyst loadings | Coconut wastes | Eggshell | Heterogeneous base catalyst | Packed bed reactor | Reaction temperature | Situ transesterification

Engineering main heading: Packed beds

EMTREE drug terms: biodiesel | calcium oxide | fatty acid ester | methanol | polyvinyl acetate

GEOBASE Subject Index: biofuel | bioreactor | catalyst | diesel | eggshell | plant residue | reaction kinetics | solid waste

EMTREE medical terms: Article | catalyst | chemical composition | coconut milk | concentration (parameters) | Fourier transform infrared spectroscopy | priority journal | reaction analysis | reaction optimization | scanning electron microscopy | solid waste | surface area | temperature sensitivity | transesterification | X ray diffraction

Chemicals and CAS Registry Numbers:

calcium oxide, 1305-78-8; methanol, 67-56-1; polyvinyl acetate, 9003-20-7

Funding details

Funding number	Funding sponsor	Acronym	Funding opportunities
2013	Ministry of Higher Education, Malaysia	MOHE	
FRGS13-079-0320	Ministry of Higher Education, Malaysia	MOHE	
15-333RG/REN/AS_C–FR3240288948			
	Ministry of Higher Education, Malaysia	MOHE	

Funding text

This research is funded by Ministry of Higher Education of Malaysia (MOHE) -Fundamental Research Grant Scheme 2013 (FRGS13-079-0320) and TWAS-COMSTECH Research Grant_REF: 15-333RG/REN/AS_C–FR3240288948 .

ISSN: 0956053X
CODEN: WAMAE
Source Type: Journal
Original language: English
DOI: 10.1016/j.wasman.2018.07.015
Document Type: Article
Publisher: Elsevier Ltd

References (48)

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1 Abo El-Enin, S.A., Attia, N.K., El-Ibiari, N.N., El-Diwani, G.I., El-Khatib, K.M.
In-situ transesterification of rapeseed and cost indicators for biodiesel production
(2013) *Renewable and Sustainable Energy Reviews*, 18, pp. 471-477. Cited 24 times.
doi: 10.1016/j.rser.2012.10.033
View at Publisher

2 Ali, Z.I., Saleh, H.H., Afify, T.A.
Optical, structural and catalytic evaluation of gamma-irradiation synthesized Ag/PVA nanocomposite films
(2014) *Int. J. Eng. Res. Technol.*, 3, pp. 1527-1538. Cited 2 times.

3 Atabani, A.E., Silitonga, A.S., Badruddin, I.A., Mahlia, T.M.I., Masjuki, H.H., Mekhilef, S.

A comprehensive review on biodiesel as an alternative energy resource and its characteristics

(2012) *Renewable and Sustainable Energy Reviews*, 16 (4), pp. 2070-2093. Cited 599 times.
doi: 10.1016/j.rser.2012.01.003

View at Publisher

4 Atadashi, I.M., Aroua, M.K., Abdul Aziz, A.R., Sulaiman, N.M.N.

Removal of residual palm oil-based biodiesel catalyst using membrane ultra-filtration technique: An optimization study (Open Access)

(2014) *Alexandria Engineering Journal*, 53 (3), pp. 705-715. Cited 9 times.
http://www.elsevier.com/wps/find/journaldescription.cws_home/724292/description#description
doi: 10.1016/j.aej.2014.07.002

View at Publisher

5 Balázsi, C., Wéber, F., Kövér, Z., Horváth, E., Németh, C.

Preparation of calcium-phosphate bioceramics from natural resources

(2007) *Journal of the European Ceramic Society*, 27 (2-3), pp. 1601-1606. Cited 92 times.
doi: 10.1016/j.jeurceramsoc.2006.04.016

View at Publisher

6 Barabás, I., Todorut, I.-A.
(2011) , p. 392.
Biodiesel-quality, emissions and by-products. In: Biodiesel: Quality, Emissions and by-Products.
http://doi.org/10.5772/2284

7 Bart, J.C., Palmeri, N., Cavallaro, S.
(2010)
Biodiesel science and technology: from soil to oil.

8 Bergamasco, J., de Araujo, M.V., de Vasconcellos, A., Luizon Filho, R.A., Hatanaka, R.R., Giotto, M.V., Aranda, D.A.G., (...), Nery, J.G.

Enzymatic transesterification of soybean oil with ethanol using lipases immobilized on highly crystalline PVA microspheres

(2013) *Biomass and Bioenergy*, 59, pp. 218-233. Cited 9 times.
doi: 10.1016/j.biombioe.2013.09.006

View at Publisher

9 Birla, A., Singh, B., Upadhyay, S.N., Sharma, Y.C.

Kinetics studies of synthesis of biodiesel from waste frying oil using a heterogeneous catalyst derived from snail shell

(2012) *Bioresource Technology*, 106, pp. 95-100. Cited 159 times.
doi: 10.1016/j.biortech.2011.11.065

View at Publisher

10 Boey, P.-L., Maniam, G.P., Hamid, S.A.
Performance of calcium oxide as a heterogeneous catalyst in biodiesel production: A review
(2011) *Chemical Engineering Journal*, 168 (1), pp. 15-22. Cited 135 times.
doi: 10.1016/j.cej.2011.01.009
View at Publisher

11 Buasri, A., Chaiyut, N., Loryuenyong, V., Wongweang, C., Khamsrisuk, S.
Application of eggshell wastes as a heterogeneous catalyst for biodiesel production
(2013) *Sustain. Energy*, 1, pp. 7-13. Cited 27 times.

12 Chandrahasa, R., Rajamane, N.P.
Development of cellulose nanofibres from coconut husk
(2014) *Int. J. Emerg. Technol. Adv. Eng.*, 4, pp. 88-93. Cited 2 times.

13 Correia, L.M., Saboya, R.M.A., de Sousa Campelo, N., Cecilia, J.A., Rodríguez-Castellón, E., Cavalcante, C.L., Vieira, R.S.
Characterization of calcium oxide catalysts from natural sources and their application in the transesterification of sunflower oil
(2014) *Bioresource Technology*, 151, pp. 207-213. Cited 49 times.
www.elsevier.com/locate/biortech
doi: 10.1016/j.biortech.2013.10.046
View at Publisher

14 Diya'Uddeen, B.H., Abdul Aziz, A.R., Daud, W.M.A.W., Chakrabarti, M.H.
Performance evaluation of biodiesel from used domestic waste oils: A review
(2012) *Process Safety and Environmental Protection*, 90 (3), pp. 164-179. Cited 53 times.
doi: 10.1016/j.psep.2012.02.005
View at Publisher

15 El-Gendy, N.S., Deriase, S.F., Hamdy, A., Abdallah, R.I.
Statistical optimization of biodiesel production from sunflower waste cooking oil using basic heterogeneous biocatalyst prepared from eggshells (Open Access)
(2015) *Egyptian Journal of Petroleum*, 24 (1), pp. 37-48. Cited 14 times.
http://www.journals.elsevier.com/egyptian-journal-of-petroleum
doi: 10.1016/j.ejpe.2015.02.004
View at Publisher

16 Engin, B., Demirtaş, H., Eken, M.
Temperature effects on egg shells investigated by XRD, IR and ESR techniques
(2006) *Radiation Physics and Chemistry*, 75 (2), pp. 268-277. Cited 49 times.
doi: 10.1016/j.radphyschem.2005.09.013
View at Publisher

17 Gashaw, A., Lakachew, A.
Production of biodiesel from non edible oil and its properties
(2014) *Int. J. Sci. Environ. Technol.*, 3, pp. 1544-1562. Cited 10 times.

18 Gonçalves, F.A., Ruiz, H.A., Nogueira, C.D.C., Santos, E.S.D., Teixeira, J.A., De Macedo, G.R.
Comparison of delignified coconuts waste and cactus for fuel-ethanol production by the simultaneous and semi-simultaneous saccharification and fermentation strategies

(2014) *Fuel*, 131, pp. 66-76. Cited 36 times.
doi: 10.1016/j.fuel.2014.04.021

View at Publisher

19 Hariharan, M., Varghese, N., Cherian, A.B., Paul, J.
(2014)
Synthesis and characterisation of CaCO3 (Calcite) nano particles from cockle shells using chitosan as precursor.

20 Hindryawati, N., Maniam, G.P., Karim, M.R., Chong, K.F.
Transesterification of used cooking oil over alkali metal (Li, Na, K) supported rice husk silica as potential solid base catalyst (Open Access)

(2014) *Engineering Science and Technology, an International Journal*, 17 (2), pp. 95-103. Cited 27 times.
www.journals.elsevier.com/engineering-science-and-technology-an-international-journal/
doi: 10.1016/j.jestch.2014.04.002

View at Publisher

21 Hu, S., Guan, Y., Wang, Y., Han, H.
Nano-magnetic catalyst KF/CaO-Fe_3O_4 for biodiesel production

(2011) *Applied Energy*, 88 (8), pp. 2685-2690. Cited 94 times.
http://www.elsevier.com/inca/publications/store/4/0/5/8/9/1/index.htt
doi: 10.1016/j.apenergy.2011.02.012

View at Publisher

22 Jazie, A.A., Pramanik, H., Sinha, A.S.K.
Transesterification of peanut and rapeseed oils using waste of animal bone as cost effective catalyst
(2013) *Mater. Renew. Sustain. Energy*, 2, p. 11. Cited 6 times.

23 Jazie, A.A., Pramanik, H., Sinha, A.S.K.
Egg shell as eco - friendly catalyst for transesterification of rapeseed oil: optimization for biodiesel production
(2013) *Int. J. Sustain. Dev. Green Econ.*, 2, pp. 2315-4721.
(Spec. Issue)

24 Jazie, A.A., Pramanik, H., Sinha, A.S.K.
(2012) , pp. 52-57.
Egg shell waste-catalyzed transesterification of mustard oil : optimization using response surface methodology (RSM). In: 2012 2nd Int. Conf. Power Energy Syst., vol. 56.
http://doi.org/10.7763/IPCSIT.2012.V56.10

25 Khemthong, P., Luadthong, C., Nualpaeng, W., Changsuwan, P., Tongprem, P., Viriya-Empikul, N., Faungnawakij, K.

Industrial eggshell wastes as the heterogeneous catalysts for microwave-assisted biodiesel production

(2012) *Catalysis Today*, 190 (1), pp. 112-116. Cited 76 times.
doi: 10.1016/j.cattod.2011.12.024

View at Publisher

26 Kostić, M.D., Bazargan, A., Stamenković, O.S., Veljković, V.B., McKay, G.

Optimization and kinetics of sunflower oil methanolysis catalyzed by calcium oxide-based catalyst derived from palm kernel shell biochar

(2016) *Fuel*, 163, pp. 304-313. Cited 32 times.
http://www.journals.elsevier.com/fuel/
doi: 10.1016/j.fuel.2015.09.042

View at Publisher

27 Lengyel, J., Cvengrošová, Z., Cvengroš, J.
Transesterification of triacylglycerols over calcium oxide as heterogeneous catalyst
(2009) *Pet. Coal*, 51, pp. 216-224. Cited 10 times.

28 Moradi, G.R., Mohadesi, M., Ghanbari, M., Moradi, M.J., Hosseini, S., Davoodbeygi, Y.

Kinetic comparison of two basic heterogenous catalysts obtained from sustainable resources for transesterification of waste cooking oil

(2015) *Biofuel Research Journal*, 2 (2), pp. 236-241. Cited 17 times.
https://www.biofueljournal.com/article_8816_14157a1c3e1a713cddc543704f7dc367.pdf
doi: 10.18331/BRJ2015.2.2.5

View at Publisher

29 Nakatani, N., Takamori, H., Takeda, K., Sakugawa, H.

Transesterification of soybean oil using combusted oyster shell waste as a catalyst

(2009) *Bioresource Technology*, 100 (3), pp. 1510-1513. Cited 169 times.
doi: 10.1016/j.biortech.2008.09.007

View at Publisher

30 Nasaruddin, R.R., Alam, Z., Jami, M.S.
Enzymatic biodiesel production from sludge palm oil (SPO) using locally produced Candida cylindracea lipase
(2013) *Afr. J. Biotechnol.*, 12, pp. 4966-4974. Cited 7 times.

31 Ng, S.P., Tan, C.P., Lai, O.M., Long, K., Mirhosseini, H.

Extraction and characterization of dietary fiber from coconut residue

(2010) *Journal of Food, Agriculture and Environment*, 8 (2), pp. 172-177. Cited 17 times.
http://www.world-food.net/scientficjournal/2010/issue2/pdf/food/f33.pdf

32 Niju, S., Begum, K.M.M.S., Anantharaman, N.
Modification of egg shell and its application in biodiesel production (Open Access)

(2014) *Journal of Saudi Chemical Society*, 18 (5), pp. 702-706. Cited 41 times.
http://www.sciencedirect.com/science/journal/13196103
doi: 10.1016/j.jscs.2014.02.010

View at Publisher

33 Noshadi, I., Kanjilal, B., Du, S., Bollas, G.M., Suib, S.L., Provatas, A., Liu, F., (...), Parnas, R.S.
Catalyzed production of biodiesel and bio-chemicals from brown grease using Ionic Liquid functionalized ordered mesoporous polymer

(2014) *Applied Energy*, 129, pp. 112-122. Cited 27 times.
http://www.elsevier.com/inca/publications/store/4/0/5/8/9/1/index.htt
doi: 10.1016/j.apenergy.2014.04.090

View at Publisher

34 Wan Omar, W.N.N., Saidina Amin, N.A.
Optimization of heterogeneous biodiesel production from waste cooking palm oil via response surface methodology

(2011) *Biomass and Bioenergy*, 35 (3), pp. 1329-1338. Cited 83 times.
doi: 10.1016/j.biombioe.2010.12.049

View at Publisher

35 Rampe, M.J., Setiaji, B., Trisunaryanti, W.
Fabrication and characterization of carbon composite from coconut shell carbon
(2011) *Indo. J. Chem.*, 11, pp. 124-130. Cited 7 times.

36 Rohim, R., Ahmad, R., Ibrahim, N., Hamidin, N., Zulzikrami, C., Abidin, A.
Characterization of calcium oxide catalyst from eggshell waste
(2014) *Adv. Environ. Biol.*, 8, pp. 35-38. Cited 6 times.

37 Sagiroglu, A., Isbilir, S.S., Ozcan, H.M., Paluzar, H., Toprakkiran, N.M.
Comparison of biodiesel productivities of different vegetable oils by acidic catalysis

(2011) *Chemical Industry and Chemical Engineering Quarterly*, 17 (1), pp. 53-58. Cited 13 times.
http://www.ache.org.rs/CICEQ/2011/No1/CICEQ_Vol17_%20No1_pp53-58_Jan-Mar_2011.pdf
doi: 10.2298/CICEQ100114054S

View at Publisher

38 Sanford, S., White, J., Shah, P.
Feedstock and biodiesel characteristics report
(2009) *Renewable Energy*. Cited 25 times.

39 Sanjay, B.
Non-conventional seed oils as potential feedstocks for future biodiesel industries: a brief review
(2013) *Res. J. Chem. Sci.*, 3, pp. 99-103. Cited 13 times.

40 Sivapragasam, A.
(2008) , pp. 1-9.
Coconut in Malaysia – current developments and potential. In: 2nd International Plantation Industry Conference and Exhibition (IPICEX2008), Shah Alam, Malaysia

41 Sulaiman, S., Abdul Aziz, A.R., Aroua, M.K.
Optimization and modeling of extraction of solid coconut waste oil

(2013) *Journal of Food Engineering*, 114 (2), pp. 228-234. Cited 26 times.
doi: 10.1016/j.jfoodeng.2012.08.025

View at Publisher

42 Sulaiman, S., Abdul Aziz, A.R., Aroua, M.K.
Reactive extraction of solid coconut waste to produce biodiesel

(2013) *Journal of the Taiwan Institute of Chemical Engineers*, 44 (2), pp. 233-238. Cited 23 times.
doi: 10.1016/j.jtice.2012.10.008

View at Publisher

43 Sulaiman, S.
(2010)
Abdul Aziz, A.R., Aroua, M.K. Coconut waste as a source for biodiesel production. In: 2nd International Conference on Chemical, Biological and Environmental Engineering (ICBEE).

44 Tariq, M., Ali, S., Ahmad, F., Ahmad, M., Zafar, M., Khalid, N., Khan, M.A.
Identification, FT-IR, NMR (^{1}H and ^{13}C) and GC/MS studies of fatty acid methyl esters in biodiesel from rocket seed oil

(2011) *Fuel Processing Technology*, 92 (3), pp. 336-341. Cited 136 times.
doi: 10.1016/j.fuproc.2010.09.025

View at Publisher

45 Tobergte, D.R., Curtis, S.
Physical properties of coconut shell nanoparticles
(2013) *J. Chem. Inf. Model.*, 53, pp. 1689-1699. Cited 132 times.

46 Wei, Z., Xu, C., Li, B.
Application of waste eggshell as low-cost solid catalyst for biodiesel production

(2009) *Bioresource Technology*, 100 (11), pp. 2883-2885. Cited 257 times.
doi: 10.1016/j.biortech.2008.12.039

View at Publisher

47 Witoon, T.
Characterization of calcium oxide derived from waste eggshell and its application as CO2 sorbent

(2011) *Ceramics International*, 37 (8), pp. 3291-3298. Cited 80 times.
doi: 10.1016/j.ceramint.2011.05.125

View at Publisher

48 Zabeti, M., Daud, W.M.A.W., Aroua, M.K.

Biodiesel production using alumina-supported calcium oxide: An optimization study

(2010) *Fuel Processing Technology*, 91 (2), pp. 243-248. Cited 129 times.
doi: 10.1016/j.fuproc.2009.10.004

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