Scarcity in fuel from fossil fuel has led to exploration of potential substitutes from renewable sources. Biodiesel as one of renewable energy sources is identified as a cleaner alternative to petroleum fuel. This paper reports on the study of potassium carbonate, \( K_2CO_3 \) sourced from pineapple and orange peels as heterogeneous catalyst for biodiesel production. \( K_2CO_3 \) was produced by drying of fruit peel prior to calcination at temperature ranged from 700°C to 1000°C for 2 to 4 hours. To determine the physicochemical properties of the resulting ash, Fourier transform infrared (FTIR) and Scanning electron microscopy (SEM) analysis were employed for the characterization of the solid. Through FTIR analysis, the presence of carbonate was confirmed while SEM analysis revealed the morphological properties of the catalyst. Biodiesel with highest yield of 95.6% was produced at 60°C, 2.75 wt% of catalyst and 12:1 molar ratio of methanol to oil. © 2018 Author(s).

Abstract

Funding details

This research is funded by Ministry of Higher Education-FRGS 2013 grant (FRGS 13-079-0320) and TWAS-COMSTECH Research Grant_REF:15-333 RG/REN/AS_C – FR3240288948.

ISSN: 0094243X
ISBN: 978-073541752-6
Source Type: Conference Proceeding
Original language: English

DOI: 10.1063/1.5066931
Document Type: Conference Paper
Publisher: American Institute of Physics Inc.
   An economically viable synthesis of biodiesel from a crude Millettia pinnata oil of Jharkhand, India as feedstock and crab shell derived catalyst
   View at Publisher

2. Al-Jammal, N., Al-Hamamre, Z., Alnaief, M.
   Manufacturing of zeolite based catalyst from zeolite tuft for biodiesel production from waste sunflower oil
   doi: 10.1016/j.renene.2016.03.018
   View at Publisher

   Biodiesel production from green seaweed Ulva fasciata catalyzed by novel waste catalysts from Pakistan Steel Industry

4. 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
   doi: 10.1016/j.fuel.2015.09.042
   View at Publisher

5. Farooq, M., Ramli, A.
   Biodiesel production from low FFA waste cooking oil using heterogeneous catalyst derived from chicken bones
   doi: 10.1016/j.renene.2014.11.042
   View at Publisher

6. Grant, B.L.
   (2016) Gardening Know How.
   (December)

7. Taiwo, O.E., Osinowo, F.A.O.
   Evaluation of various agro-wastes for traditional black soap production
   doi: 10.1016/S0960-8524(00)00188-7
   View at Publisher

The ancient alkali production technology and the modern improvement: A review
(Open Access)

doi: 10.3923/ajaps.2011.22.29

View at Publisher


Oil palm trunk and sugarcane bagasse derived heterogeneous acid catalysts for production of fatty acid methyl esters

doi: 10.1016/j.energy.2014.04.024

View at Publisher

10. Kumar, A.

Extraction of caustic potash from coffee husk: Process optimization through response surface methodology


Wood ash as a potential heterogeneous catalyst for biodiesel synthesis

doi: 10.1016/j.biombioe.2012.02.017

View at Publisher

12. Kambo, H.S., Dutta, A.

A comparative review of biochar and hydrochar in terms of production, physico-chemical properties and applications

doi: 10.1016/j.rser.2015.01.050

View at Publisher


An analysis of metal concentrations in food wastes for biogas production

http://www.journals.elsevier.com/renewable-and-sustainable-energy-reviews/
doi: 10.1016/j.renene.2014.11.010

View at Publisher


Effect of pineapple waste powder on probiotic growth, antioxidant and antimutagenic activities of yogurt

http://www.springerlink.com/content/121580/
doi: 10.1007/s13197-015-2100-0

View at Publisher
Hossain, M.F., Akhtar, S., Anwar, M.  
Nutritional value and medicinal benefits of pineapple  

Kumar, A., Gautam, A., Dutt, D.  
Biotechnological transformation of lignocellulosic biomass in to industrial products: An overview  

Ferrara, F., Orsini, A., Plaisant, A., Pettinaiu, A.  
Pyrolysis of coal, biomass and their blends: Performance assessment by thermogravimetric analysis  
www.elsevier.com/locate/biotech  
doi: 10.1016/j.biortech.2014.08.104  
View at Publisher

Chouhan, A.P.S., Sarma, A.K.  
Biodiesel production from Jatropha curcas L. oil using Lemna perpusilla Torrey ash as heterogeneous catalyst  
doi: 10.1016/j.biombioe.2013.02.009  
View at Publisher

Ofori-Boateng, C., Lee, K.T.  
The potential of using cocoa pod husks as green solid base catalysts for the transesterification of soybean oil into biodiesel: Effects of biodiesel on engine performance  
doi: 10.1016/j.cej.2013.01.046  
View at Publisher

Gin, W., Jimoh, A., Abdulkareem, A., Giwa, A.  
Production of activated carbon from watermelon peel  

Roschat, W., Siritanon, T., Kaewpuang, T., Yoosuk, B., Promarak, V.  
Economical and green biodiesel production process using river snail shells-derived heterogeneous catalyst and co-solvent method  
www.elsevier.com/locate/biortech  
doi: 10.1016/j.biortech.2016.03.038  
View at Publisher
Wine production by novel yeast biocatalyst prepared by immobilization on watermelon (Citrullus vulgaris) rind pieces and characterization of volatile compounds
View at Publisher

Lu, L., Kong, C., Sahajwalla, V., Harris, D.
Char structural ordering during pyrolysis and combustion and its influence on char reactivity
doi: 10.1016/S0016-2361(02)00035-2
View at Publisher

Uyigue, L., Viele, E., Chukwuma, F.
A Preliminary Assessment of the Potash Biocatalyst Potential of Empty-Oil-Palm-Bunch (EOPB) Residues for Biodiesel Production

Chen, G.-Y., Shan, R., Shi, J.-F., Yan, B.-B.
Transesterification of palm oil to biodiesel using rice husk ash-based catalysts
doi: 10.1016/j.fuproc.2015.01.005
View at Publisher

Yaakob, Z., Sukarman, I.S.B., Narayanan, B., Abdullah, S.R.S., Ismail, M.
Utilization of palm empty fruit bunch for the production of biodiesel from Jatropha curcas oil
View at Publisher

PVA supported catalytic membranes obtained by γ-irradiation for biodiesel production
doi: 10.1016/j.radphyschem.2013.05.058
View at Publisher

Production of biodiesel through transesterification of soybean oil using lithium orthosilicate solid catalyst
doi: 10.1016/j.fuproc.2012.05.009
View at Publisher
Kesić, Ž., Lukić, I., Zdujić, Č., Jovalekić, Č., Liu, H., Skala, D.
Mechanochemical synthesis of CaO·ZnO·K₂CO₃ catalyst: Characterization and activity for methanolysis of sunflower oil  (Open Access)
doi: 10.2298/CICEQ131026041K

Chin, L.H., Hameed, B.H., Ahmad, A.L.
Process Optimization for Biodiesel Production from Waste Cooking Palm Oil (Elaeis guineensis) Using Response Surface Methodology
http://pubs.acs.org/doi/pdfplus/10.1021/ef8007954
doi: 10.1021/ef8007954

Hayyan, A., Mjalli, F.S., Hashim, M.A., Hayyan, M., Alnashef, I.M.
Conversion of free fatty acids in low grade crude palm oil to methyl esters for biodiesel production using chromosulfuric acid