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Production of green diesel via cleaner catalytic deoxygenation of Jatropha curcas oil (Article)

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Abstract

View references (47)

Utilization of green diesel derived from biomass in industries and transportation has significantly increased energy security by reducing the dependency on the petroleum and balancing the overall greenhouse gas emission. In the present study, jatropha oil -derived green diesel was produced via catalytic deoxygenation process by using multi-walled carbon nanotube (MWCNTs)-supported catalysts (Co/MWCNT, Ni/MWCNT and Ni–Co/MWCNT). The use of active bimetallic promoter (Ni–Co) showed high catalytic activity in decarboxylation/decarbonylation routes with a total of 80% of saturated and unsaturated hydrocarbon in range of C_8–C_{17}. Furthermore, Ni–Co/MWCNT showed high selectivity towards C_{15}- and C_{17}-hydrocarbon, which suggested that the presence of acidity work selectively in mild cracking of triglyceride structure and performed actively in deoxygenation . © 2016 Elsevier Ltd

Reaxys Database Information

View Compounds

Author keywords

Deoxygenation | Diesel | JCO | Metal oxide | MWCNT

Indexed keywords

Engineering controlled terms: Carbon | Carbon nanotubes | Carboxylation | Catalyst activity | Energy security | Greenhouse gases | Hydrocarbons | Metals | Petroleum transportation | Yarn

Engineering uncontrolled terms: Deoxygenations | Diesel | Green diesels | High selectivity | Jatropha Curcas oil | Metal oxides | MWCNT | Unsaturated hydrocarbons

Engineering main heading: Multiwalled carbon nanotubes (MWCN)

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References (47)

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1 Abdulkareem-Alsultan, G., Asikin-Mijan, N., Lee, H.V., Taufiq-Yap, Y.H.

A new route for the synthesis of La-Ca oxide supported on nano activated carbon via vacuum impregnation method for one pot esterification-transesterification reaction

(2016) *Chemical Engineering Journal*, 304, pp. 61-71. Cited 13 times.
www.elsevier.com/inca/publications/store/6/0/1/2/7/3/index.htt
doi: 10.1016/j.cej.2016.05.116

View at Publisher

2 Ahmed, S., Hassan, M.Hj., Kalam, Md.A., Ashrafur Rahman, S.M., Abedin, Md.J., Shahir, A.

An experimental investigation of biodiesel production, characterization, engine performance, emission and noise of Brassica juncea methyl ester and its blends

(2014) *Journal of Cleaner Production*, 79, pp. 74-81. Cited 37 times.
doi: 10.1016/j.jclepro.2014.05.019

View at Publisher

3 Akalework, N.G., Pan, C.-J., Su, W.-N., Rick, J., Tsai, M.-C., Lee, J.-F., Lin, J.-M., (...), Hwang, B.-J.

Ultrathin TiO2-coated MWCNTs with excellent conductivity and SMSI nature as Pt catalyst support for oxygen reduction reaction in PEMFCs

(2012) *Journal of Materials Chemistry*, 22 (39), pp. 20977-20985. Cited 58 times.
http://www.rsc.org/Publishing/Journals/jm/index.asp
doi: 10.1039/c2jm34361d

View at Publisher

4 Arend, M., Nonnen, T., Hoelderich, W.F., Fischer, J., Groos, J.

Catalytic deoxygenation of oleic acid in continuous gas flow for the production of diesel-like hydrocarbons

(2011) *Applied Catalysis A: General*, 399 (1-2), pp. 198-204. Cited 49 times.
doi: 10.1016/j.apcata.2011.04.004

View at Publisher

5 Asikin-Mijan, N., Lee, H.V., Taufiq-Yap, Y.H., Juan, J.C., Rahman, N.A.

Pyrolytic-deoxygenation of triglyceride via natural waste shell derived $Ca(OH)_2$ nanocatalyst

(2016) *Journal of Analytical and Applied Pyrolysis*, 117, pp. 46-55. Cited 12 times.
doi: 10.1016/j.jaap.2015.12.017

View at Publisher

6 Asikin-Mijan, N., Lee, H.V., Juan, J.C., Noorsaadah, A.R., Abdulkareem-Alsultan, G., Arumugam, M., Taufiq-Yap, Y.H.

Waste clamshell-derived CaO supported Co and W catalysts for renewable fuels production via cracking-deoxygenation of triolein

(2016) *Journal of Analytical and Applied Pyrolysis*, 120, pp. 110-120. Cited 10 times.
doi: 10.1016/j.jaap.2016.04.015

View at Publisher

Promoting deoxygenation of triglycerides via Co-Ca loaded SiO2-Al

Asikin-Mijan, N. , Lee, H.V. , Juan, J.C.
(2018) Applied Catalysis A: General

Deoxygenation of waste cooking to renewable diesel over walnut shell-derived nanorode activated carbon supported CaO-La2O3catalyst

Alsultan, G.A. , Asikin-Mijan, N. , Lee, H.V.
(2017) Energy Conversion and Management

Optimization study of SiO2-Al bifunctional acid–base NiO-CaO for renewable fuel production using response surface methodology

Asikin-Mijan, N. , Lee, H.V. , Taufiq-Yap, Y.H.
(2017) Energy Conversion and Management

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7 Ayodele, O.B., Abbas, H.F., Daud, W.M.A.W.
Catalytic upgrading of oleic acid into biofuel using Mo modified zeolite supported Ni oxalate catalyst functionalized with fluoride ion

(2014) *Energy Conversion and Management*, 88, pp. 1111-1119. Cited 10 times.
doi: 10.1016/j.enconman.2014.02.014

View at Publisher

8 Bacha, J., Freel, J., Gibbs, A., Gibbs, L., Hemighaus, G., Hoekman, K., Horn, J., (...), Mills, J.
Diesel fuels technical review
(2007) *Chevron Glob. Mark.*, pp. 1-107. Cited 7 times.

9 Bezergianni, S., Voutetakis, S., Kalogianni, A.
Catalytic hydrocracking of fresh and used cooking oil

(2009) *Industrial and Engineering Chemistry Research*, 48 (18), pp. 8402-8406. Cited 65 times.
http://pubs.acs.org/doi/pdfplus/10.1021/ie900445m
doi: 10.1021/ie900445m

View at Publisher

10 Boullosa-Eiras, S., Lødeng, R., Bergem, H., Stöcker, M., Hannevold, L., Blekkan, E.A.
Catalytic hydrodeoxygenation (HDO) of phenol over supported molybdenum carbide, nitride, phosphide and oxide catalysts

(2014) *Catalysis Today*, 223, pp. 44-53. Cited 78 times.
doi: 10.1016/j.cattod.2013.09.044

View at Publisher

11 Ding, R., Wu, Y., Chen, Y., Liang, J., Liu, J., Yang, M.
Effective hydrodeoxygenation of palmitic acid to diesel-like hydrocarbons over MoO_2/CNTs catalyst
(2014) *Chem. Eng. Sci.*, pp. 1-9.

12 Dovì, V.G., Friedler, F., Huisingh, D., Klemeš, J.J.
Cleaner energy for sustainable future

(2009) *Journal of Cleaner Production*, 17 (10), pp. 889-895. Cited 186 times.
doi: 10.1016/j.jclepro.2009.02.001

View at Publisher

13 Elkasabi, Y., Mullen, C.A., Pighinelli, A.L.M.T., Boateng, A.A.
Hydrodeoxygenation of fast-pyrolysis bio-oils from various feedstocks using carbon-supported catalysts

(2014) *Fuel Processing Technology*, 123, pp. 11-18. Cited 40 times.
doi: 10.1016/j.fuproc.2014.01.039

View at Publisher

14 Gao, L., Yoo, E., Nakamura, J., Zhang, W., Chua, H.T.

Hydrogen storage in Pd-Ni doped defective carbon nanotubes through the formation of CH_x (x = 1, 2)

(2010) *Carbon*, 48 (11), pp. 3250-3255. Cited 25 times.
http://www.journals.elsevier.com/carbon/
doi: 10.1016/j.carbon.2010.05.015

View at Publisher

15 Hermida, L., Abdullah, A.Z., Mohamed, A.R.

Deoxygenation of fatty acid to produce diesel-like hydrocarbons: A review of process conditions, reaction kinetics and mechanism

(2015) *Renewable and Sustainable Energy Reviews*, 42, pp. 1223-1233. Cited 36 times.
doi: 10.1016/j.rser.2014.10.099

View at Publisher

16 Huber, G.W., O'Connor, P., Corma, A.

Processing biomass in conventional oil refineries: Production of high quality diesel by hydrotreating vegetable oils in heavy vacuum oil mixtures

(2007) *Applied Catalysis A: General*, 329, pp. 120-129. Cited 392 times.
doi: 10.1016/j.apcata.2007.07.002

View at Publisher

17 Hussan, Md.J., Hassan, M.Hj., Kalam, Md.A., Memon, L.A.

Tailoring key fuel properties of dieselebiodieseleethanol blends for diesel engine

(2013) *Journal of Cleaner Production*, 51, pp. 118-125. Cited 27 times.
doi: 10.1016/j.jclepro.2013.01.023

View at Publisher

18 Iijima, S.

Helical microtubules of graphitic carbon

(1991) *Nature*, 354 (6348), pp. 56-58. Cited 32054 times.
doi: 10.1038/354056a0

View at Publisher

19 Kaewmeesri, R., Srifa, A., Itthibenchapong, V., Faungnawakij, K.

Deoxygenation of waste chicken fats to green diesel over Ni/Al_2O_3: Effect of water and free fatty acid content

(2015) *Energy and Fuels*, 29 (2), pp. 833-840. Cited 18 times.
http://pubs.acs.org/journal/enfuem
doi: 10.1021/ef5023362

View at Publisher

20 Klemeš, J.J., Varbanov, P.S., Pierucci, S., Huisingh, D.

Minimising emissions and energy wastage by improved industrial processes and integration of renewable energy

(2010) *Journal of Cleaner Production*, 18 (9), pp. 843-847. Cited 64 times.
doi: 10.1016/j.jclepro.2010.02.028

View at Publisher

21 Knothe, G.

Dependence of biodiesel fuel properties on the structure of fatty acid alkyl esters

(2005) *Fuel Processing Technology*, 86 (10), pp. 1059-1070. Cited 1248 times.
doi: 10.1016/j.fuproc.2004.11.002

View at Publisher

22 Ko, C.H., Park, S.H., Jeon, J.-K., Suh, D.J., Jeong, K.-E., Park, Y.-K.

Upgrading of biofuel by the catalytic deoxygenation of biomass

(2012) *Korean Journal of Chemical Engineering*, 29 (12), pp. 1657-1665. Cited 65 times.
doi: 10.1007/s11814-012-0199-5

View at Publisher

23 Kordulis, C., Bourikas, K., Gousi, M., Kordouli, E., Lycourghiotis, A.

Development of nickel based catalysts for the transformation of natural triglycerides and related compounds into green diesel: A critical review

(2016) *Applied Catalysis B: Environmental*, 181, pp. 156-196. Cited 43 times.
www.elsevier.com/inca/publications/store/5/2/3/0/6/6/index.htt
doi: 10.1016/j.apcatb.2015.07.042

View at Publisher

24 Kwon, K.C., Mayfield, H., Marolla, T., Nichols, B., Mashburn, M.

Catalytic deoxygenation of liquid biomass for hydrocarbon fuels

(2011) *Renewable Energy*, 36 (3), pp. 907-915. Cited 59 times.
doi: 10.1016/j.renene.2010.09.004

View at Publisher

25 Lee, H.V., Juan, J.C., Taufiq-Yap, Y.H.

Preparation and application of binary acid-base CaO-La_2O_3 catalyst for biodiesel production

(2015) *Renewable Energy*, 74, pp. 124-132. Cited 51 times.
http://www.elsevier.com/inca/publications/store/9/6/9/index.htt
doi: 10.1016/j.renene.2014.07.017

View at Publisher

26 Lestari, S., Mäki-Arvela, P., Eränen, K., Beltramini, J., Max Lu, G.Q., Murzin, D.Yu.

Diesel-like hydrocarbons from catalytic deoxygenation of stearic acid over supported pd nanoparticles on SBA-15 catalysts

(2010) *Catalysis Letters*, 134 (3-4), pp. 250-257. Cited 71 times.
doi: 10.1007/s10562-009-0248-9

View at Publisher

27 Liu, Y., Sotelo-Boyás, R., Murata, K., Minowa, T., Sakanishi, K.

Production of Bio-Hydrogenated diesel by hydrotreatment of High-Acid-Value waste cooking oil over ruthenium catalyst supported on Al-Polyoxocation-Pillared montmorillonite (Open Access)

(2012) *Catalysts*, 2 (1), pp. 171-190. Cited 25 times.
http://www.mdpi.com/2073-4344/2/1/171/pdf
doi: 10.3390/catal2010171

View at Publisher

28 Lovás, P., Hudec, P., Hadvinová, M., Ház, A.

Conversion of rapeseed oil via catalytic cracking: Effect of the ZSM-5 catalyst on the deoxygenation process

(2015) *Fuel Processing Technology*, 134, art. no. 4434, pp. 223-230. Cited 14 times.
doi: 10.1016/j.fuproc.2015.01.038

View at Publisher

29 Morgan, T., Santillan-Jimenez, E., Harman-Ware, A.E., Ji, Y., Grubb, D., Crocker, M.

Catalytic deoxygenation of triglycerides to hydrocarbons over supported nickel catalysts

(2012) *Chemical Engineering Journal*, 189-190, pp. 346-355. Cited 73 times.
doi: 10.1016/j.cej.2012.02.027

View at Publisher

30 Mortensen, P.M., Grunwaldt, J.-D., Jensen, P.A., Knudsen, K.G., Jensen, A.D.

A review of catalytic upgrading of bio-oil to engine fuels

(2011) *Applied Catalysis A: General*, 407 (1-2), pp. 1-19. Cited 696 times.
doi: 10.1016/j.apcata.2011.08.046

View at Publisher

31 Park, S.-J., Jeong, H.-J., Nah, C.

A study of oxyfluorination of multi-walled carbon nanotubes on mechanical interfacial properties of epoxy matrix nanocomposites

(2004) *Materials Science and Engineering A*, 385 (1-2), pp. 13-16. Cited 59 times.
doi: 10.1016/j.msea.2004.03.041

View at Publisher

32 Qian, E.W., Chen, N., Gong, S.

Role of support in deoxygenation and isomerization of methyl stearate over nickel-molybdenum catalysts

(2014) *Journal of Molecular Catalysis A: Chemical*, 387, pp. 76-85. Cited 19 times.
doi: 10.1016/j.molcata.2014.02.031

View at Publisher

33 Rahman, M.M., Hassan, M.H., Kalam, M.A., Atabani, A.E., Memon, L.A., Rahman, S.M.A.

Performance and emission analysis of Jatropha curcas and Moringa oleifera methyl ester fuel blends in a multi-cylinder diesel engine

(2014) *Journal of Cleaner Production*, 65, pp. 304-310. Cited 48 times.
doi: 10.1016/j.jclepro.2013.08.034

View at Publisher

34 Romero, M.J.A., Pizzi, A., Toscano, G., Busca, G., Bosio, B., Arato, E.

Deoxygenation of waste cooking oil and non-edible oil for the production of liquid hydrocarbon biofuels

(2016) *Waste Management*, Part A 47, pp. 62-68. Cited 18 times.
www.elsevier.com/locate/wasman
doi: 10.1016/j.wasman.2015.03.033

View at Publisher

35 Sahoo, S.K., Ray, S.S., Singh, I.D.

Structural characterization of coke on spent hydroprocessing catalysts used for processing of vacuum gas oils

(2004) *Applied Catalysis A: General*, 278 (1), pp. 83-91. Cited 45 times.
http://www.sciencedirect.com/science/journal/0926860X
doi: 10.1016/j.apcata.2004.09.028

View at Publisher

36 Sanjid, A., Masjuki, H.H., Kalam, M.A., Rahman, S.M.A., Abedin, M.J., Palash, S.M.

Production of palm and jatropha based biodiesel and investigation of palm-jatropha combined blend properties, performance, exhaust emission and noise in an unmodified diesel engine

(2014) *Journal of Cleaner Production*, 65, pp. 295-303. Cited 63 times.
doi: 10.1016/j.jclepro.2013.09.026

View at Publisher

37 Santillan-Jimenez, E., Morgan, T., Lacny, J., Mohapatra, S., Crocker, M.

Catalytic deoxygenation of triglycerides and fatty acids to hydrocarbons over carbon-supported nickel

(2013) *Fuel*, 103, pp. 1010-1017. Cited 86 times.
doi: 10.1016/j.fuel.2012.08.035

View at Publisher

38 Simakova, I., Simakova, O., Mäki-Arvela, P., Simakov, A., Estrada, M., Murzin, D.Yu.

Deoxygenation of palmitic and stearic acid over supported Pd catalysts: Effect of metal dispersion

(2009) *Applied Catalysis A: General*, 355 (1-2), pp. 100-108. Cited 129 times.
doi: 10.1016/j.apcata.2008.12.001

View at Publisher

39 Snåre, M., Kubičková, I., Mäki-Arvela, P., Eränen, K., Murzin, D.Yu.

Heterogeneous catalytic deoxygenation of stearic acid for production of biodiesel

(2006) *Industrial and Engineering Chemistry Research*, 45 (16), pp. 5708-5715. Cited 355 times.
doi: 10.1021/ie060334i

View at Publisher

40 Snåre, M., Kubičková, I., Mäki-Arvela, P., Eränen, K., Wärnå, J., Murzin, D.Yu.

Production of diesel fuel from renewable feeds: Kinetics of ethyl stearate decarboxylation

(2007) *Chemical Engineering Journal*, 134 (1-3), pp. 29-34. Cited 105 times.
doi: 10.1016/j.cej.2007.03.064

View at Publisher

41 Tan, C.-Y., Tsai, W.-T.

Effects of Ni and Co-decorated MWCNTs addition on the dehydrogenation behavior and stability of LiAlH4

(2015) *International Journal of Hydrogen Energy*, 40 (40), pp. 14064-14071. Cited 7 times.
http://www.journals.elsevier.com/international-journal-of-hydrogen-energy/
doi: 10.1016/j.ijhydene.2015.03.027

View at Publisher

42 Vitolo, S., Seggiani, M., Frediani, P., Ambrosini, G., Politi, L.

Catalytic upgrading of pyrolytic oils to fuel over different zeolites

(1999) *Fuel*, 78 (10), pp. 1147-1159. Cited 213 times.
doi: 10.1016/S0016-2361(99)00045-9

View at Publisher

43 Wu, J., Xia, Q., Wang, H., Li, Z.

Catalytic performance of plasma catalysis system with nickel oxide catalysts on different supports for toluene removal: Effect of water vapor

(2014) *Applied Catalysis B: Environmental*, 156-157, pp. 265-272. Cited 37 times.
www.elsevier.com/inca/publications/store/5/2/3/0/6/6/index.htt
doi: 10.1016/j.apcatb.2014.03.017

View at Publisher

44 Yang, Y., Wang, Q., Zhang, X., Wang, L., Li, G.

Hydrotreating of C_{18} fatty acids to hydrocarbons on sulphided NiW/SiO_2-Al_2O_3

(2013) *Fuel Processing Technology*, 116, pp. 165-174. Cited 36 times.
doi: 10.1016/j.fuproc.2013.05.008

View at Publisher

45 Yang, C., Nie, R., Fu, J., Hou, Z., Lu, X.

Production of aviation fuel via catalytic hydrothermal decarboxylation of fatty acids in microalgae oil

(2013) *Bioresource Technology*, 146, pp. 569-573. Cited 25 times.
www.elsevier.com/locate/biortech
doi: 10.1016/j.biortech.2013.07.131

View at Publisher

46 Yang, Y., Chen, J., Shi, H.

Deoxygenation of methyl laurate as a model compound to hydrocarbons on Ni_2P/SiO_2, Ni_2P/MCM-41, and Ni $_2$P/SBA-15 catalysts with different dispersions

(2013) *Energy and Fuels*, 27 (6), pp. 3400-3409. Cited 44 times.
doi: 10.1021/ef4004895

View at Publisher

47 Zhang, H., Lin, H., Zheng, Y.

The role of cobalt and nickel in deoxygenation of vegetable oils

(2014) *Applied Catalysis B: Environmental*, 160-161 (1), pp. 415-422. Cited 24 times.
www.elsevier.com/inca/publications/store/5/2/3/0/6/6/index.htt
doi: 10.1016/j.apcatb.2014.05.043

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