Short Communication

iMedPub Journals
http://journals.imedpub.com

Archives in Chemistry

2020
Vol. 1 ISS. 2 : sc 11

Ultrasound Assisted Dispersion of Magnesium Oxide on CeMCM-41 Nanocatalyst for Biodiesel Production from Waste Vegetable Oil

Sahar Dehghani[1,2], Mohammad Haghighi [1,2],*

[1]Chemical Engineering Faculty, Sahand University of Technology, Sahand New Town, Tabriz, Iran.
[2]Reactor and Catalysis Research Center (RCRC), Sahand University of Technology, Sahand New Town, Tabriz, Iran.

cycles and biodiesel change came to 88.7% toward the finish of the last cycle which exhibits its critical steadiness The population growth and the development of industrialization have increased the demands for fossil fuels. A major issue of today's world is greenhouse effect that leads to global warming, which is one of the main reasons of weather pattern changes and serious health problems. Biodiesel is a reliable alternative to fossil diesel fuel because of exclusive properties such as biodegradability, renewability, low toxicity and eco-friendly. Because of the physicochemical similarity between biodiesel and fossil diesel, it could be used in the existing diesel engine up to a certain limit, i.e., 20% but beyond that, engine modifications would be necessary. On the other hand, the biodiesel production from inexpensive feedstock instead of refined or edible vegetable oil is another effort towards sustainability aspect; since it can prevent the waste oils depletion into the nature and thereby return these useless material to the consumption cycle through green fuel production. Recently, bifunctional catalysts with both acidic and basic sites, high ratios of surface/volume and great pores developed to per-

form esterification and transesterification reactions simultaneously. Also, utilizing mesoporous materials as heterogeneous catalysts has been of great interest, due to high surface area, uniform and narrow distribution of pore size, well-ordered pores and significant thermal stability. Mobil Composite Material No. 41 (MCM-41) is a hydrophobic mesoporous silica that synthesized by hydrothermal method. It has a large surface area and notable thermal stability which make it a remarkable choice as support for creating active sites and producing well-dispersed metal oxides. Itrepresents a hexagonal structure of high request and extraordinary adaptability. This adaptability considers the adjustment of certain properties, for example, surface causticity, pore size, warm strength, and redox attributes, through presenting metal particles, for example, Fe, Al, Zr, Ce, etc into the structure. It was accounted for that bringing Ce4+ into MCM-41 structure, produces new Lewis corrosive destinations which improves the corrosiveness of impetus.

In this investigation, Mobil Composite Material No. 41 (MCM-41) utilized as the impetus support for biodiesel creation from squander cooking oil. Additionally, Si/Ce molar proportion of 10 acquainted with the MCM-41 structure to set up an altered bifunctional nanocatalyst with high steadiness and corrosiveness. At that point, ultrasound illumination used to scatter MgO as dynamic stage on the outside of as-manufactured help. The orchestrated nanocatalysts were examined utilizing different strategies as follows: XRD, TEM, FESEM, and BET. The XRD designs alongside the consequences of BET investigation uncovered the MCM-41 structure pulverization while bringing Ce into the cross section. The molecule size and size appropriation of the nanocatalyst with Si/Ce=10 were accordingly dictated by TEM and FESEM pictures. Biodiesel creation did under after operational boundaries to assess the reactant execution of integrated examples: T=70°C, impetus loading=5 wt. %, methanol/oil molar ratio=9, and 6 h response time. Ce replacement in the help system significantly improved the biodiesel transformation. The nanocatalyst with Si/Ce=10 exhibited the phenomenal transformation of 94.3% contrasted with the nanocatalyst without Ce with 9.1% change. The reusability of the nanocatalyst with Si/Ce=10 concentrated during seven response.

References

1) Alaei, S., Haghighi, M., Toghiani, J., Rahmani Vahid, B. Industrial Crops and Products 2018; 117: 322-332.

2) Pirouzmand, M., Nikzad-kojanag, B., Seyed-Rasulzade, S.K. Catalysis Communications 2015; 69: 196-201.

3) Vardast, N., Haghighi, M., Dehghani, S. Renewable Energy 2019; 132: 979-988.

4) G. Corro, A. Flores, F. Pacheco-Aguirre, U. Pal, F. Bañuelos, A. Ramirez, A. Zehe, Biodiesel and fossil-fuel diesel soot oxidation activities of Ag/CeO2 catalyst, Fuel, 250 (2019) 17-26.

5) H. Lu, X. Yu, S. Yang, H. Yang, S.-T. Tu, MgO–Li2O catalysts templated by a PDMS–PEO comb-like copolymer for transesterification of vegetable oil to biodiesel, Fuel, 165 (2016) 215-223.

6) A.M. Rabie, M. Shaban, M.R. Abukhadra, R. Hosny, S.A. Ahmed, N.A. Negm, Diatomite supported by CaO/MgO

Note : This work is partly presented at Archives in Chemistry

nanocomposite as heterogeneous catalyst for biodiesel production from waste cooking oil, Journal of Molecular Liquids, 279 (2019) 224-231.

7) M. Manríquez-Ramírez, R. Gómez, J.G. Hernández-Cortez, A. Zúñiga-Moreno, C.M. Reza-San Germán, S.O. Flores-Valle, Advances in the transesterification of triglycerides to biodiesel using MgO–NaOH, MgO–KOH and MgO–CeO2 as solid basic catalysts, Catalysis Today, 212 (2013) 23-30.

8) W. Xie, Y. Han, H. Wang, Magnetic Fe3O4/MCM-41 composite-supported sodium silicate as heterogeneous catalysts for biodiesel production, Renewable Energy, 125 (2018) 675-681.

9) S. Karnjanakom, S. Kongparakul, C. Chaiya, P. Reubroycharoen, G. Guan, C. Samart, Biodiesel production from Hevea brasiliensis oil using SO3H-MCM-41 catalyst, Journal of Environmental Chemical Engineering, 4 (2016) 47-55.

10) M. Pirouzmand, M.M. Anakhatoon, Z. Ghasemi, One-step biodiesel production from waste cooking oils over metal incorporated MCM-41; positive effect of template, Fuel, 216 (2018) 296-300.

Note : This work is partly presented at Archives in Chemistry