Analysis of parameter and interaction between parameter of the microwave assisted transesterification process of coconut oil using response surface methodology

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TOPICS
- Biofuels
- Catalysts and Catalysis
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ABSTRACT

A simple batch process was designed for the transesterification of coconut oil to alkyl esters using microwave assisted method. The product with yield above 93.225% of alkyl ester is called the biodiesel fuel. Response surface methodology was used to design the experiment and obtain the maximum possible yield of biodiesel in the microwave-assisted reaction from coconut oil with KOH as the catalyst. The results showed that the time reaction and concentration of KOH catalyst have significant effects on yield of alkyl ester. Based on the response surface methodology using the selected operating conditions, the time of reaction and concentration of KOH catalyst in transesterification process were 150 second and 0.25%w/w, respectively. The largest predicted and experimental yield of alkyl esters (biodiesel) under the optimal conditions are 101.385% and 93.225%, respectively. Our findings confirmed the successful development of process for the transesterification reaction of coconut oil by microwave-assisted heating, which is effective and time-saving for alkyl ester production.

REFERENCES

1. A.R. Sajjadi, A. Aziz, S. Ibrahim, Renew. Energy, **37**, 762–777, (2014). https://doi.org/10.1016/j.rser.2014.05.021, Google Scholar, Crossref, CAS
2. A. Srivastava, R. Prasad, Renew. Energy, **4**, 111–133, (2000). https://doi.org/10.1016/S1364-0321(99)00013-1, Google Scholar, Crossref, CAS
3. V.R Srivathsan, L.N. Srinivasan, M. Karuppan, Bioresour. Technol, **99**, 3975–3981 (2008). https://doi.org/10.1016/j.biortech.2007.04.060, Google Scholar, Crossref
4. Y.C. Dennis, L.X. Wu, M.K.H. Leung, Appl. Energ. **87**, 1083–1095, (2010). https://doi.org/10.1016/j.apenergy.2009.10.006, Google Scholar, Crossref
5. M. Zabeti, W.M.A.W. Daud, M.K. Aroua, Fuel Process Technol. **90**, 770–777(2009). https://doi.org/10.1016/j.fuproc.2009.03.010, Google Scholar, Crossref, CAS
6. Y. Zu, S. Zhang, Y. Fu, W. Liu, Z. Liu, M. Luo, Eur. Food Res. Technol. **229**, 43–9, (2009). https://doi.org/10.1007/s00217-009-1024-1, Google Scholar, Crossref, CAS
7. N. Azcan, A. Danisman, Fuel, **86**, 39–44, (2007). https://doi.org/10.1016/j.fuel.2007.05.021, Google Scholar, Crossref
8. X. Yuan, J. Liu, G. Zeng, J. Shi, J. Tong, O. Gu, Renew. Energ. **33**, 1678–1684, (2008). https://doi.org/10.1016/j.renene.2007.09.007, Google Scholar, Crossref, CAS
9. H.C. Wang, C.Y. Wu, C.C. Chung, M.H. Lai, T.W. Chung., Ind. Eng. Chem. Res. **45**, 8043–8048, (2006). https://doi.org/10.1021/ie060299f, Google Scholar, Crossref, CAS
10. J. Kansedo, K.T. Lee, S. Bhatia, Biomass Bioenerg. **33**, 271–276, (2009). https://doi.org/10.1016/j.biombioe.2008.05.011, Google Scholar, Crossref, CAS
11. X. Chen, W. Du, D.H. Liu, Biochem. Eng. J. **40**, 423–429, (2008). https://doi.org/10.1016/j.bej.2008.01.012, Google Scholar, Crossref, CAS
12. S.F.A. Halim, H.K. Azlina, W.J.N. Fernando, Bioresour. Technol. **100**, 710–716, (2009). https://doi.org/10.1016/j.biortech.2008.07.031, Google Scholar, Crossref, CAS
13. V.G. Shashikant, R. Hifjur, Bioresour. Technol. **97**, 379–384, (2006). https://doi.org/10.1016/j.biortech.2005.03.014, Google Scholar, Crossref
14. B.I. Sarat, V.R.B. Veera, R.S. Subba, R.G. Hanumantha, Microb. Technol. **40**, 1367–1372, (2007). https://doi.org/10.1016/j.enzmictec.2006.10.012, Google Scholar, Crossref