

Effect of Calcination Time on Chicken Manure Catalyst for Transesterification Process of Waste Cooking Oil into Biodiesel

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Structured Abstract

Background: Biodiesel is a renewable and sustainable fuel that is derived from biological sources such as, plant oils, animal fats and waste cooking oil (WCO). This kind of biofuel can be added to or used in place of conventional diesel fuel, which is made from fossil fuels. Biodiesel is produced from the transesterification reaction which triglycerides (fats and oils) react with alcohol (methanol or ethanol) with the presence of catalyst (NaOH or KOH). However, the use of strong base catalysts like NaOH and KOH can be corrosive and costly.

Methods: Biodiesel is produced from the transesterification reaction which WCO reacts with methanol with the presence of CaO catalyst that derived from chicken manure. The chicken manure catalyst was undergone calcination process with temperature at 900 °C to obtain fine powder of CaO. The prepared catalyst will be characterized using Thermogravimetric Analysis (TGA), Brunauer-Emmet-Teller (BET), and Fourier Transfer Infrared (FTIR) analysis to determine the physical and chemical properties of the catalyst.

Results: Percentage of oil conversion has increased due to the time increased. There are highest percentage of oil conversion which is 29.14% for 6 hours calcined of CM was used during transesterification process. Minor quantity of oil was converted into fatty acid methyl ester (FAME) during the transesterification process, according to GC-FID analysis of waste cooking oil samples. This finding suggests that the FAME in the sample was not well separated.

Conclusion: In conclusion, the FTIR, BET, and TGA comprehensive investigations have shown that the chicken manure catalyst has a high surface area, active functional groups, and exceptional thermal stability. According to the study, calcination at 900°C for 6 hours is the ideal setting. The catalyst's efficiency was greatly increased by the particular calcination time and temperature combination that produced the most percentage of oil conversion. The best-calcined chicken manure catalyst was tested to produce biodiesel from waste cooking oil, and the results were outstanding.

Keywords: Waste Cooking Oil, Transesterification, Biodiesel, Calcination, Chicken Manure Catalyst

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