Fe_3O_4-BASED NANOCOMPOSITES AS HETEROGENEOUS CATALYSTS FOR BIODIESEL PRODUCTION

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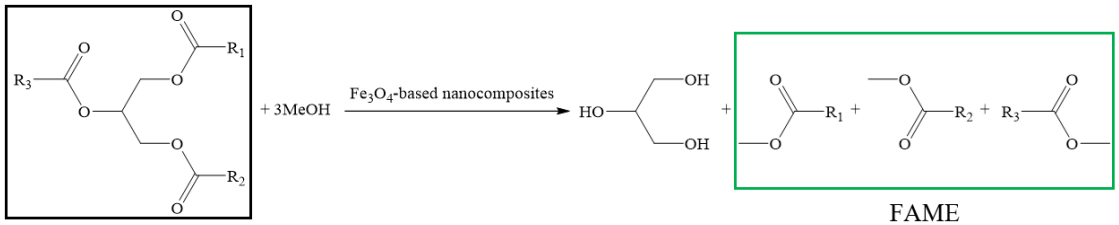
Environmental pollution and global warming have been growing with the increased use of fossil resources, and therefore, it is urgent to develop alternative clean and renewable energy sources. The primary benefit of biodiesel is its sustainability. Biodiesel can be obtained through waste materials, such as used cooking oils or animal fats [1]. In the biodiesel industry, the most common catalysts are homogeneous basic materials such as NaOH and KOH (soluble in methanol) [1]. One of the drawbacks of these catalysts compared to the heterogeneous systems is the difficulty of recycling. To overcome this limitation, magnetically recoverable Fe_3O_4-based nanocomposites were successfully synthesized, fully characterized by FT-IR, SEM, EDS elemental mapping, and explored as catalysts for biodiesel production. The magnetic properties allow the recovery of the catalyst by the simple use of a magnet to pull out the catalyst of the reaction mixture, facilitating its re-usage [2]. The effect of various parameters such as the molar ratio of methanol:oil, amount of catalyst related to oil, temperature, reaction time, and heating methods were studied towards the optimization of the catalytic process, as well as the study of the catalyst stability. Catalytic transesterification of oil to biodiesel using nanocomposite Fe_3O_4@CaO registered a weight yield of 40% which corresponded to 75% of FAME (fatty acid methyl ester) content obtained from microwave heating, at 80 ºC, 60 W with a molar ratio of 16:1 (MeOH:oil) and 9 wt% of catalyst over 2 hours reaction.



Oil FAME

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