Synthesis and characterization of Fe_3O_4/MnO_2 nanocomposite for improving of biodiesel production

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A. Stegarescu, M. L. Soran, I. Lung, O. Opriş, S. Guţoiu, C. Leoștean, D. Lazăr, I. Kacso, T.D. Silipaș, O. Pană, S. Porav

[1]National Institute for Research and Development of Isotopic and Molecular Technologies, 67-103 Donat, 400293 Cluj-Napoca, Romania

Purpose:

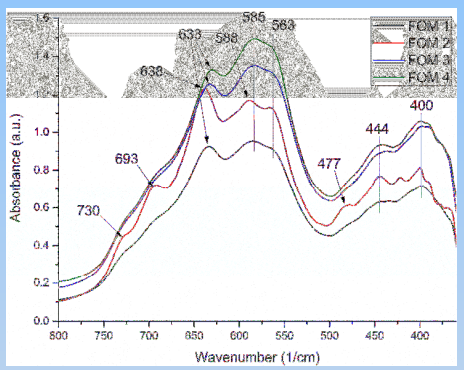
- the preparation and characterization of the Fe_3O_4/MnO_2 nanocomposite (FOM 1-4), synthesized by chemically and biochemically (using plant extracts) routes;
- test as catalyst to efficiently obtain of biofuel like the final product from the oil resulted from seeds and grapes residues by microwave-assisted transesterification.

Characterization:

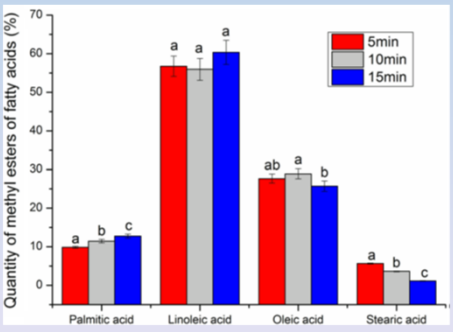
The formation of magnetic nanocomposites was confirmed by the microscopic/spectroscopic techniques, such as: XRD, BET, TEM, SEM, EDS, VSM.

Synthesis conditions for FOM samples:

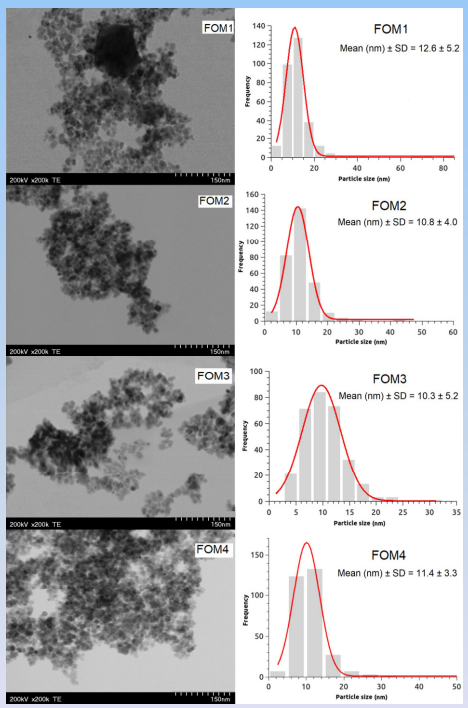
Nr. crt.	Fe_3O_4	$MnSO_4$	Urea	Oregano extract [mL]	$MnSO_4$ and urea (v/v)	Sample code
1	0.5 g	0.036 M	1 M	-	10:1	FOM 1
2		0.072 M	2 M	-		FOM 2
3		0.018 M	1 M	-		FOM 3
4		0.018 M	-	20		FOM 4



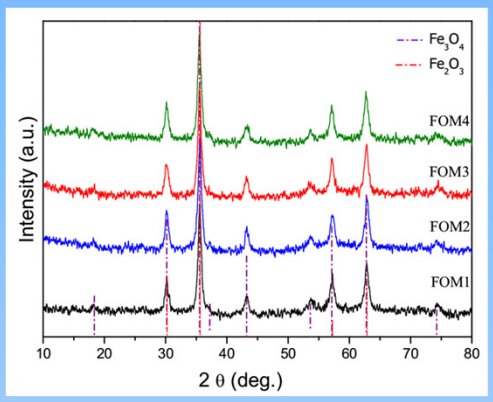
FT-IR spectrum of FOM 1-4 samples, 800-360 cm^{-1} spectral range



The **quantity (%) of methyl esters** of fatty acids in the biofuel prepared in the presence of FOM1 catalyst and microwave irradiation (800 W).



TEM images of Fe_3O_4/MnO_2 (FOM1) and the grain size distribution histograms for samples prepared nanocomposite.



XRD diffraction patterns of FOM samples

Conclusions:

- ✓ The analysis of the final results revealed that the samples chemically prepared show smaller sizes, specific surface area higher and porosity lower than the sample prepared using plant extract.
- ✓ The Fe_3O_4/MnO_2 nanocomposites with the highest specific surface area from all prepared nanocomposites, FOM1, were tested for microwave assisted transesterification studies.
- ✓ It has been shown by preliminary results that the Fe_3O_4/MnO_2 nanocomposite can be successfully used as catalyst for improving of biodiesel production.
- ✓ For all tests using FOM1 as catalyst, the resulted FAME's mixture consists mostly of C18:2, obtaining promising preliminary results. The highest quantity of linoleic acid was obtained by microwave treatment for 15 minutes at 800W.

Acknowledgements:

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