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Editors
Tamara TODOROVIĆ
Ljubodrag VUJISIĆ
Jelena RADIVOJEVIĆ
Vuk FILIPOVIĆ

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Vuk FILIPOVIĆ

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SCIENTIFIC COMMITTEE

Dr Tamara TODOROVIĆ
Dr Ljubodrag VUJISIĆ
Dr Jelena RADIVOJEVIĆ

ORGANIZING COMMITTEE

Dr Života SELAKOVIĆ
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Materials science

MS OP 05

Modified eggshell catalyst for transesterification of sunflower oil: The effects of catalyst loading on FAMEs content

Stefan M. Pavlović[1], Nebojša Vasiljević[2], Biljana Milovanović[3], Anđela Paunović[4]
[1]*University of Belgrade, Institute of Chemistry Technology, and Metallurgy, Belgrade, Serbia*
[2]*University of East Sarajevo, Faculty of Technology, Zvornik, Bosina and Herzegovina*
[3]*Alumina Ltd, Zvornik, Bosina and Herzegovina*
[4]*University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia*

Modified highly active CaO catalyst (ESCHC-600) derived from waste chicken eggshells were prepared and used in the transesterification of sunflower oil. Eggshells were subjected to calcination-hydration-calcination (CHC) cycles described in detail previously [1]. After CHC treatments, highly active CaO was obtained, which indicates its great potential for biodiesel synthesis. The transesterification reaction was carried out in a batch reactor at 60 ºC, methanol to oil molar ratio of 12:1, and different catalyst concentrations ranging from 2 to 8 wt%. Fatty acid methyl esters (FAMEs) content was determined by the HPLC analytical technique. The highest triacylglycerols (TAGs) conversion to FAMEs was achieved at a catalyst loading of 4 wt% (Fig. 1a). A further increase in catalyst loading (> 4 wt%) led to a decrease in TAGs conversion. The higher catalyst loadings (6 and 8 wt%) limited mass transfer of the TAGs and reaction products (FAMEs, DAGs and MAGs) due to the higher reaction mixture density and viscosity of the complex multiphase system. Compared to raw eggshell calcined at 900 ºC (ES-900) (Fig. 1b), the synthesized ESCHC-600 catalyst showed a higher activity, which could be attributed to a more favourable pore structure of CHC treated catalyst and better availability of the active sites.

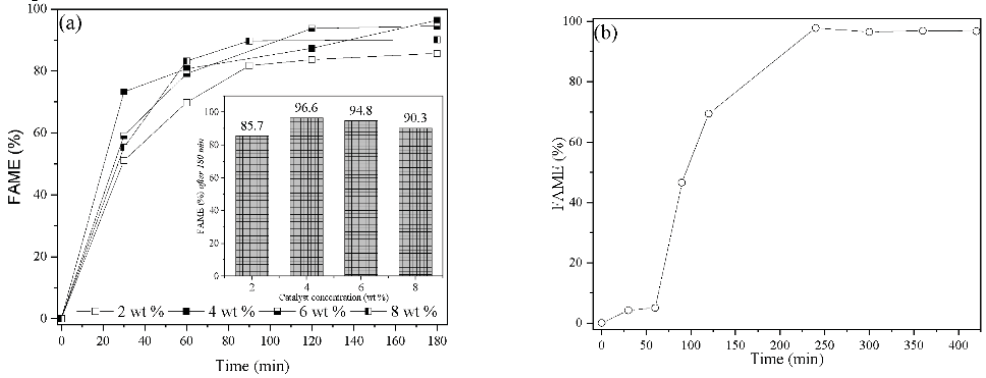

Figure 1. Variations of FAME content with time (a) at different concentration of ESHC-600 and (b) for reaction with ES-900

References

[1] S. Pavlovic, D. Marinkovic, B. Milovanovic, M. Kostic, M. Gabrovska, D. Nikolova, M. Stankovic, *14th European Congress on Catalysis*, **2019**, 643-644

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