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ADVANCED CERAMICS AND APPLICATION II
New Frontiers in Multifunctional Material Science and Processing

Serbian Ceramic Society
Institute of Chemistry Technology and Metallurgy
Institute for Technology of Nuclear and Other Raw Mineral Materials
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Archeological Institute of SASA

PROGRAM AND THE BOOK OF ABSTRACTS

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Dr Nina Obradovic
Dr Lidija Mančić

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Biodiesel synthesis based on $CaO{\cdot}ZnO{\cdot}K_2CO_3$ as catalyst

Željka Kesić[1], Ivana Lukić[1], Miodrag Zdujić[2], Čedomir Jovalekić[3],Yong Shao[4], Hui Liu[4], Dejan Skala[5]

[1] niversity of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia
[2]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia
[3]University of Belgrade, Institute for Multidisciplinary Research, Belgrade, Serbia
[4]University of Geosciences, School of Environmental Studies, Wuhan, PR China
[5]University of Belgrade, IChTM Center for Catalysis and Chemical Engineering, Belgrade, Serbia

Mixed oxide-carbonate with composition $CaO{\cdot}2ZnO{\cdot}_xK_2CO_3$ obtained by ball milling of CaO, ZnO, K_2CO_3 (where x=0, 1, 2 and 4, moles of K_2CO_3 per 10 moles of CaO) and water, after calcination at 700 ^oC was used as catalyst for biodiesel synthesis in 300 cm^3 batch autoclave at 70 ^oC. Used molar ratio of methanol to sunflower oil of 10:1 and 2 wt% of catalyst based on oil weight was usual working condition in all the experiments of biodiesel synthesis. The prepared catalysts were characterized by base strength using Hammett indicator, by measurement of bulk and surface catalyst composition using inductively coupled plasma (ICP) and X-ray photoelectron spectroscopy (XPS), as well as by determination of Ca, Zn and K ions solubility in methanol at 60 ^oC. Conversion of triglyceride (TG) during methanolysis catalyzed with prepared catalyst was determined by gas chromatography. Addition of K_2CO_3 in the process of $CaO{\cdot}ZnO$ mixed oxide preparation significantly improve an initial rate of methanolysis (during the first hour of biodiesel synthesis) comparing to the "pure" $CaO{\cdot}ZnO$ catalyst. It was shown that addition of higher amount of K_2CO_3 for mixed oxide-carbonate preparation significantly increases the initial activity of catalyst and that such an effect is caused by homogeneous–heterogeneous catalysis of biodiesel synthesis.

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Aerosol-assisted synthesis of hierarchically organized titania and titanates nanostructures

Ivan M. Dugandžić[1], Dragana J. Jovanović[2], Lidija T. Mančić[1], Zoran V. Šaponjić[2], Jovan M. Nedeljković[2], Olivera B. Milošević[1]

[1]Institute of Technical Science of SASA, KnezMihailova 35-IV, 11000 Belgrade, Serbia
[2]Vinča Institute of Nuclear Sciences, University of Belgrade, 11001 Belgrade, Serbia

The aerosol route, representing a feasible bottom-up technique for nanomaterials processing in disperse system, was applied for the low-temperature (T=150 ^oC) synthesis of spherical, non-agglomerated, hierarchically organized titania and titanates nanostructures. The diverse levels of structural, morphological and functional complexity were explored by using appropriate colloidal precursors comprising either spherical nanoparticles or nanotubes. In both cases, spherical, grained, submicronic sized particles with the average diameter of ~350 nm for titania and ~ 450 nm for titanates were obtained. The detailed structural and morphological investigations were done according to X-ray powder diffraction (XRPD), scanning and field emission electron microscopy (SEM/FESEM), particle size distribution (PSD) and transmission electron microscopy (TEM)