FIRST INTERNATIONAL CONFERENCE ON ELECTRON MICROSCOPY OF NANOSTRUCTURES

ELMINA 2018

ПРВА МЕЂУНАРОДНА КОНФЕРЕНЦИЈА О ЕЛЕКТРОНСКОЈ МИКРОСКОПИЈИ НАНОСТРУКТУРА

САНУ

August 27-29, 2018, Belgrade, Serbia
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FIRST INTERNATIONAL CONFERENCE

ELMINA 2018

PROGRAM & BOOK OF ABSTRACTS

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Organized by:
Serbian Academy of Sciences and Arts and Faculty of Technology and Metallurgy, University of Belgrade

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FIRST INTERNATIONAL CONFERENCE
ELMINA 2018
Program and Book of Abstracts

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At the beginning we wish you all welcome to Belgrade and ELMINA2018 International Conference organized by the Serbian Academy of Sciences and Arts and the Faculty of Technology and Metallurgy, University of Belgrade. We are delighted to have such a distinguished lineup of plenary speakers who have agreed to accept an invitation from the Serbian Academy of Sciences and Arts to come to the first in a series of electron microscopy conferences: Electron Microscopy of Nanostructures, ELMINA2018. We will consider making it an annual event in Belgrade, due to this year's overwhelming response of invited speakers and young researchers. The scope of ELMINA2018 will be focused on electron microscopy, which provides structural, chemical and electronic information at atomic scale, applied to nanoscience and nanotechnology (physics, chemistry, materials science, earth and life sciences), as well as advances in experimental and theoretical approaches, essential for interpretation of experimental data and research guidance. It will highlight recent progress in instrumentation, imaging and data analysis, large data set handling, as well as time and environment dependent processes. The scientific program contains the following topics:

- Instrumentation and New Methods
- Diffraction and Crystallography
- HRTEM and Electron Holography
- Analytical Microscopy (EDS and EELS)
- Nanoscience and Nanotechnology
- Life Sciences

To put this Conference in proper prospective, we would like to remind you that everything related to nanoscience and nanotechnology started 30 to 40 years ago as a long term objective, and even then it was obvious that transmission electron microscopy (TEM) must play an important role, as it was the only method capable of analyzing objects at the nanometer scale. The reason was very simple - at that time, an electron microscope was the only instrument capable of detecting the location of atoms, making it today possible to control synthesis of objects at the nanoscale with atomic precision. Electron microscopy is also one of the most important drivers of development and innovation in the fields of nanoscience and nanotechnology relevant for many areas of research such as biology, medicine, physics, chemistry, etc. We are very proud that a large number of contributions came from young researchers and students which was one of the most important objectives of ELMINA2018, and which indicates the importance of electron microscopy in various research fields. We are happy to present this book, comprising of the Conference program and abstracts, which will be presented at ELMINA2018 International Conference. We wish you all a wonderful and enjoyable stay in Belgrade.

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Synthesis, Calcination and Characterization of $CoMoO_4$ Nanopowders by GNP Method

Milena Rosić[1], Dejan Zagorac[1], Maria Čebela[1], Dragana Jordanov[1], Jelena Zagorac[1], Jelena Luković[1], Aleksandra Zarubica[2] and Branko Matović[1]

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Molybdates are of interest in various applications, e.g. catalysts [1], catalyst precursors [2], optical and electrode materials [3,4] and supercapacitors [5,6]. Synthesizing nanopowders of $CoMoO_4$ could improve their properties thereof, since; various properties of materials differ from bulk to nanostructure. Metal molybdate nanostructures are well suited for energy-storage devices because they are environmentally safe and exhibit enhanced performance compared to their corresponding oxides. Nanosized $CoMoO_4$ powder was synthesized by glycine nitrate procedure (GNP). We focused on the chemical synthesis method for producing nanoparticles in a simple, quick, and inexpensive way, the method which effectively in the first step of the preparative process produces nanosized metal molybdate powders. The synthesized samples were investigated by DTA, X-ray diffraction (XRD), Fourier transform infrared (FT-IR) spectra, Field emission scanning electron microscopy (FESEM), and nitrogen adsorption method. The photocatalytic activity of obtained $CoMoO_4$ nanopowders was estimated by the photocatalytic degradation of crystal violet in aqueous solution. This work has provided simple and effective method for controlling the composition and morphology of $CoMoO_4$ powders, which revealed a potential new approach in inorganic synthesis methodology. DTA curve for the synthesized powder of $CoMoO_4$ indicates formation of β-$CoMoO_4$ in the temperature range 360 to 416 °C and the possibility of forming α-$CoMoO_4$ and polymorphic transition $\beta \rightarrow \alpha$ at 913 °C. XRD pattern of the obtained nanopowder shows that $CoMoO_4$ crystallizes in the monoclinic space group C2/m, No.12. Presence of single-phase α and β crystalline forms of the $CoMoO_4$ compound was confirmed by X-ray diffraction (XRD). Volumes of the unit cells of the two structural types decrease with increasing temperature. The prepared $CoMoO_4$ nanopowder exhibited agglomeration tendency and it is characterized by inhomogeneous microstructure with partial allocations of grains and almost ordered shapes. The polyhedral grains of different sizes and plate-like crystals 3–47 nm in size, grown on irregular grains, are forming grape-like structure, with interstices and voids between them. A sponge-type morphology involving large numbers of irregular connected pores is attributed to the large amount/ volume of gases escaping out of the reaction mixture during the combustion. On the other hand, large individual spherical and polyhedral grains which are regular in shape are present. The observed grains have smooth and non-porous surfaces. The specific surface areas of all $CoMoO_4$ samples are within 15 and 24 m^2 g^{-1} confirming mainly mesoporous structure. The above GNP method is technically simple, quick, and suitable for low-cost preparation of high-quality $CoMoO_4$ nanopowder of significant specific surface area. The photocatalytic testing of the $CoMoO_4$ nanopowders showed that these nanostructured materials can be promising solutions in photocatalytic processes oriented toward green chemistry and sustainable development. This stands especially for samples activated at higher temperatures probably due to their beneficial properties (particular single α-phase modification, large pore radius/diameter, great pore volume and acceptable specific surface area, typical arranged morphology and specific surface functional groups).

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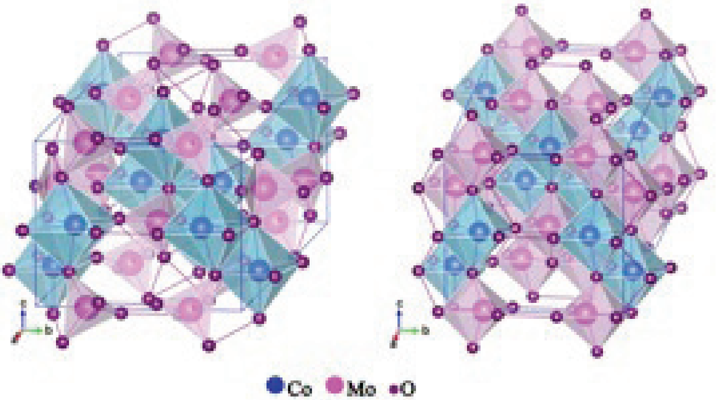

Figure 1. Structure of a) β-$CoMoO_4$ (synthesized and calcinated samples at 450 °C) and b) α-$CoMoO_4$ (samples at 1000 °C).

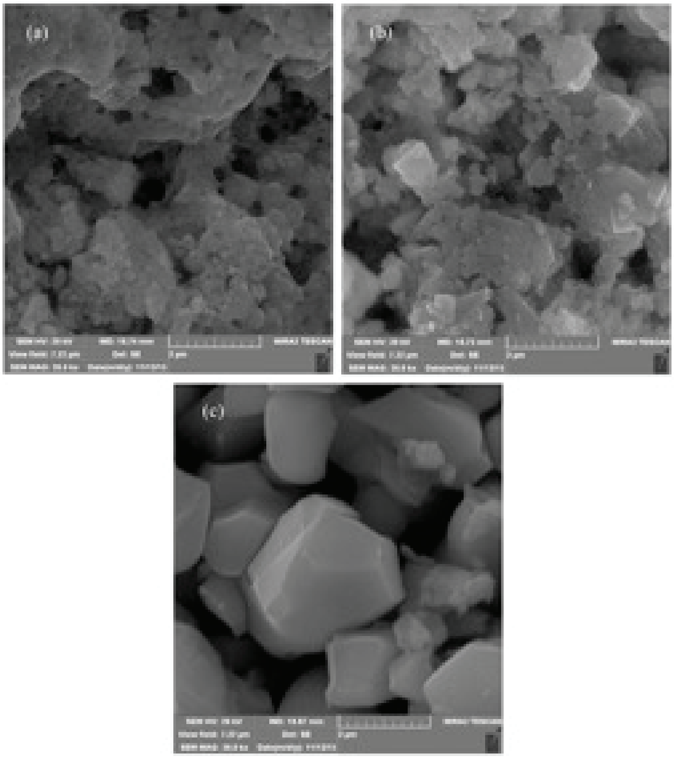

Figure 2. FESEM images of $CoMoO_4$ samples: a) as prepared; b) calcinated at 450 °C and c) calcinated at 1000 °C.

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