FIRST INTERNATIONAL CONFERENCE ON ELECTRON MICROSCOPY OF NANOSTRUCTURES

ELMINA 2018

ПРВА МЕЂУНАРОДНА КОНФЕРЕНЦИЈА О ЕЛЕКТРОНСКОЈ МИКРОСКОПИЈИ НАНОСТРУКТУРА

August 27-29, 2018, Belgrade, Serbia
27–29. август 2018. Београд, Србија

FIRST INTERNATIONAL CONFERENCE

ELMINA 2018

PROGRAM

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BOOK OF ABSTRACTS

Rectorate of the University of Belgrade, Belgrade, Serbia
August 27-29, 2018
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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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Alkali Activated Slag as Adsorbents for Cu^{2+} Removal from Wastewaters

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The removal of heavy metals from wastewaters is presently a global imperative primarily due to their well-known toxic nature and detrimental effects on the environment, and more importantly, on human health. Currently, special attention is paid to the use of novel slag based materials – alkali activated slag (AAS) as potential novel adsorbents [1]. Our previous studies have shown that electric arc furnace slag (EAFS) can be successfully used as a precursor for the production of AAS [2]. Generally, alkaline activation involves a chemical reaction between solid aluminosilicate materials and a highly alkaline activator. The alkali activation mechanism of slag involves the dissolution of slag in a highly alkaline [3], which is followed by the condensation and hardening processes. Dependent on the pH and type of alkaline activator, calcium (alumina) silicate hydrate or *C–(A)–S–H* gel has been identified as a reaction product of slag alkali activation [4].

The objective of this research was to investigate the removal of Cu^{2+} from aquatic solution using alkali activated slag (AAS) obtained by alkaline activation of EAFS. The AAS sample was synthesized at a constant solid to liquid mass ratio of 4:1, using an alkali activator prepared by mixing 10M NaOH and Na_2SiO_3 (water glass: Na_2O = 8.5%, SiO_2 = 28.5%, density of 1.39 kg/m^3) solutions in a mass ratio of 2:1. The paste obtained by alkali activation was cast in a plastic mold and cured for 48 h at 65 °C. For the purpose of batch adsorption experiments, hardened AAS samples were crushed. The batch adsorption tests were performed by mixing solid AAS samples with solution containing Cu^{2+} at the solid to liquid ratio of 0.4:1 at initial Cu^{2+} concentration of 100 ppm, for a period of 35 min. Sample characterization (XRDP, FTIR and SEM/EDS) before and after the adsorption test was carried out as to further illustrate the effectiveness of AAS as an adsorbent.

Microstructural and chemical investigations were carried out using the FEI Helios NanoLab 660 SEM/FIB dual beam system, equipped with the EDAX energy dispersive spectrometer (EDS) and the FEI TITAN Themis[3] 300, equipped with the Super-X EDS system controlled with Bruker Esprit software.

The results of morphological investigations reported in our previous study [2] have shown that alkaline activation leads to the partial dissolution of EAFS and the formation of a C–(A)–S–H gel. Thus, the microstructure of AAS is heterogenous and comprises of unreacted EAFS and the reaction product, the C–(A)–S–H gel [2]. Scanning electron back scattered micrographs of the AAS sample after adsorption and appropriate EDS maps of element distribution are given in Fig. 1. It is evident that newly formed platelets on the surface of AAS particles are present (Fig. 1a inset). The cross-section of an AAS particle after the adsorption test (Fig. 1b) and appropriate EDS maps indicate that AAS particles are uniformly covered with the platelets containing Cu, O and S. Scanning transmission electron micrographs (STEM) in high angle annular dark field (HAADF) mode along with appropriate EDS maps indicate that there is a relationship between the distribution of Cu, S and O (Fig. 2). X-ray powder diffraction as well as Fourier Transform Infrared (FT–IR) spectroscopy of metal loaded AAS samples indicated that Cu^{2+} ions have been attached on the surface of AAS in the form of a posnjakite crystal phase.

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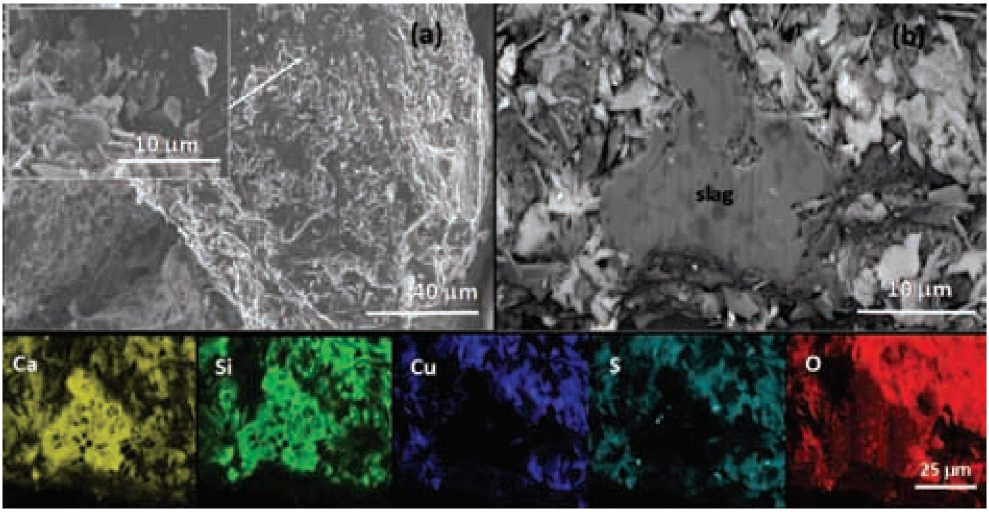

Figure 1. Scanning electron back scattered micrographs of AAS sample in a) top view and b) cross-section along with with appropriate EDS maps.

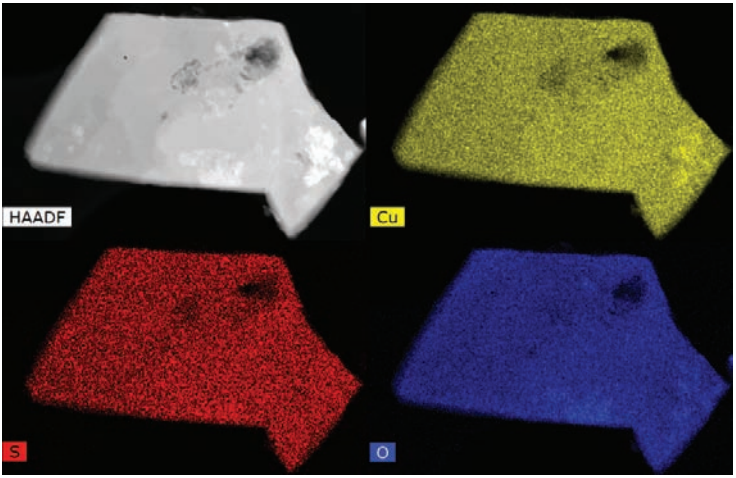

Figure 2. HAADF STEM micrograph of platelet and corresponding EDS maps of Cu, S and O distribution.

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