



**Serbian Ceramic Society Conference  
ADVANCED CERAMICS AND APPLICATION VII  
New Frontiers in Multifunctional Material Science and Processing**

**Serbian Ceramic Society  
Institute of Technical Sciences of SASA  
Institute for Testing of Materials  
Institute of Chemistry Technology and Metallurgy  
Institute for Technology of Nuclear and Other Raw Mineral Materials**

**PROGRAM AND THE BOOK OF ABSTRACTS**

**Serbian Academy of Sciences and Arts, Knez Mihailova 35  
Serbia, Belgrade, 17-19. September 2018.**

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## Kinetics and thermodynamics of zinc(II) ions adsorption from aqueous solution on natural Romania zeolite

Maja Đolić<sup>1</sup>, Jelena Rusmirović<sup>2,3</sup>, Zlate Veličković<sup>4</sup>,  
Mirjana Čujić<sup>1</sup>, Aleksandar Marinković<sup>5</sup>

<sup>1</sup> Vinča Institute OF Nuclear Sciences, University of Belgrade, 11000 Belgrade, Serbia

<sup>2</sup> Innovation center, Faculty of Technology and Metallurgy, University of Belgrade, 11120 Belgrade, Serbia

<sup>3</sup> Military Technical Institute, 11000 Belgrade, Serbia

<sup>4</sup> Military Academy, University of defence, 11000 Belgrade, Serbia

<sup>5</sup> Faculty of Technology and Metallurgy, University of Belgrade, 11120 Belgrade, Serbia

Adsorption performances of natural zeolite, originating from Mare Baia, Romania, was tested in this study. The main constituent of used adsorbent was clinoptilolite, 80 %, with molecular formula  $(\text{Na}_{0.52}\text{K}_{2.44}\text{Ca}_{1.48})(\text{Al}_{6.59}\text{Si}_{29.41}\text{O}_{72})(\text{H}_2\text{O})_{28}$ , 64, as obtained by the use of XRD. The adsorbent BET specific surface area was 45.7 m<sup>2</sup>/g and particle size distribution in the range 0.4-0.8 mm. Prior to the experimental procedure, material was washed by deionized water, dried for 2 h at 105°C and placed in desiccator. The homogenization of dry sorbent was reached using mortar and pestle. Minimal processing for material preparation was accomplished in order to simplify its production. Zeolite was tested as natural sorbent for zinc(II) ions removal from water solution. Influence of zeolite mass, temperature and contact time on adsorption capacities, kinetics and thermodynamics was investigated. Zinc(II) ion removal capacity of 65.5 mg g<sup>-1</sup> at 318.15 K, obtained using of Langmuir 2 model, indicated that natural zeolite had high efficiency in processes of Zinc removal. Kinetic study fitting by Weber-Morris model predicted intra-particle diffusion as a rate-controlling step.

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## Effect of Alkaline Activator Properties on Structure of Metakaolin-Based Geopolymer Samples

Marija Ivanović<sup>1</sup>, Nataša Mladenović<sup>2</sup>, Jelena Gulicovski<sup>1</sup>, Vladimir Pavlović<sup>3</sup>,  
Vera Pavlović<sup>4</sup>, Ljiljana Kljajević<sup>1</sup>, Snežana Nenadović<sup>1</sup>

<sup>1</sup> Department of Materials, Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia

<sup>2</sup> Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

<sup>3</sup> Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Knez Mihailova 35/IV, University of Belgrade, 11000 Belgrade, Serbia

<sup>4</sup> Faculty of Mechanical Engineering, University of Belgrade, Belgrade, Serbia

Considering geopolymers as inorganic polymers, they are actually amorphous network of interlinked silicate and aluminate groups, so they could be prospective ceramic precursors for materials with defined dimensions obtained by casting and firing, but not from powder processing. In this research, the starting material is metakaolin, which was obtained by calcining domes-

tic kaolinite clay. Initially, four series of alkaline activators of NaOH and sodium silicate have been used. Activators present the mixtures of  $\text{Na}_2\text{SiO}_3$  and solutions of NaOH, of different molarities 2M, 4M, 6M and 8M. The prepared geopolymer slurries were cast into the designated near shape at room temperature and after that at 60°C. In fact, the post-synthesis curing process (28 days) has an important role in the obtaining good characteristics of geopolymers. Densities, viscosities and refractive index of alkaline activators were determined over the temperature range 15-60°C of process of geopolymerizations. Based on the obtained results of investigated parameters have been selected to predict the properties of materials. All geopolymer samples were characterized by XRD, FTIR, SEM/EDS analysis and Raman spectroscopy providing complementary and valuable information of the investigated materials. This route of ceramics production has advantages associated with producing an environmental friendly, energy saving, clean new technology of geopolymer materials.

## P11

### Adsorption capacities of Shungite - a Russian Mineral

Nina Obradović<sup>1</sup>, Jelena Rusmirović<sup>2,3</sup>

<sup>1</sup> *Institute of Technical Sciences of SASA, Knez Mihailova 35/IV, 11000 Belgrade, Serbia*

<sup>2</sup> *Innovation center, Faculty of Technology and Metallurgy,  
University of Belgrade, Karnegijeva 4, 11120 Belgrade, Serbia*

<sup>3</sup> *Military Technical Institute, Ratka Resanovića 1, 11000 Belgrade, Serbia*

Shungite, a carbon-rich rock of the Precambrian age widespread over Russia, attracts much attention due to possibilities of application in various industrial and medical fields. Carbon acts as an efficient catalyst of hydrogenation at low temperatures, as an adsorbent and filter in water purification processes, and as a multifunctional filler of polymeric and inorganic binders.

The presence of the starting components  $\alpha\text{-SiO}_2$ ,  $\text{Fe}_2\text{O}_3$ , carbon C,  $\alpha\text{-Al}_2\text{O}_3$ ,  $\gamma\text{-Al}_2\text{O}_3$ , and  $\text{CaCO}_3$  has been determined by XRD measurement. Particle size distribution of the initial powder indicates large agglomerates with size of 10 microns and larger, confirmed by SEM also. In a batch test, the influence of shungite mass, contact time and temperature on adsorption efficiency of amlodipine, medicament used to treat high blood pressure and coronary artery disease, has been investigated. This material showed moderate adsorption capacity of 54.95 mg/g at 10 mg/l initial amlodipine concentration. The concentrations of amlodipine were determined using UV-VIS spectrometry.