

Association of Metallurgical Engineers of Serbia  
Faculty of Technology and Metallurgy, University of Belgrade  
Institute for Technology of Nuclear and Other Mineral Raw Materials  
Institute of Chemistry, Technology and Metallurgy  
Vinca Institute of Nuclear Sciences  
Serbian Foundrymen's Society

**MME SEE**

**2019**

Metallurgical & Materials  
Engineering Congress  
of South-East Europe

**BOOK OF ABSTRACTS**

June, 5<sup>th</sup> - 7<sup>th</sup> 2019, Belgrade, Serbia  
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Editors:

Dragomir Glišić  
Branislav Marković  
Vaso Manojlović

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**Branislav Marković**

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**Vaso Manojlović**

Faculty of Technology and Metallurgy, University of Belgrade

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## **PREFACE**

The Fourth Metallurgical & Materials Engineering Congress of South-East Europe (MME SEE 2019) is a biannual meeting of scientists, professionals, and specialists working in the fields of metallurgical and materials engineering. The aim of the Congress is to present current research results related to processing/structure/property relationships, advances in processing, characterization, and applications of modern materials.

Congress encompasses a wide range of related topics and presents the current views from both academia and industry: Future of metals/materials industry in South-East European countries; Raw materials; New industrial achievements, developments and trends in metals/materials; Ferrous and nonferrous metals production; Metal forming, casting, refractories and powder metallurgy; New and advanced ceramics, polymers and composites; Characterization and structure of materials; Recycling and waste minimization; Corrosion, coating, and protection of materials; Process control and modeling; Nanotechnology; Sustainable development; Welding; Environmental protection; Education; Accreditation & certification.

The Editors hope that Congress will stimulate new ideas and improve the knowledge in the field of metallurgical and materials engineering.

The Congress is organized jointly by the Association of Metallurgical Engineers of Serbia, Faculty of Technology and Metallurgy, University of Belgrade, Institute for Technology of Nuclear and Other Mineral Raw Materials, Institute of Chemistry, Technology and Metallurgy, Vinca Institute of Nuclear Sciences and Serbian Foundrymen's Society.

The Editors would like to thank the Scientific and the Organizing Committee, the Congress Secretariat - CONGREXPO d.o.o. and all those who helped in making the Congress a success.

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*Editors*

## GLASS- CERAMICS OBTAINED FROM COPPER MINE TAILINGS AND GLASS CULLETS

Veljko V. Savić<sup>1</sup>, S. D. Matijašević<sup>1</sup>, V. S. Topalović<sup>1</sup>, S. V. Smiljanić<sup>2</sup>,  
J. D. Nikolić<sup>1</sup>, S. N. Zildžović<sup>1</sup>, S. R. Grujić<sup>2</sup>

*e-mail: v.savic@itnms.ac.rs*

<sup>1</sup>*Institute for Technology of Nuclear and other Mineral Raw Materials,  
86 Franchet d' Esperey St, 1100 Belgrade, Serbia,*

<sup>2</sup>*Faculty of Technology and Metallurgy, 4 Karnegijeva St., 11000 Belgrade, Serbia*

Copper mine tailings are one of the most used secondary raw materials. The most common use is in the cement industry and as filler in road construction. The area of secondary raw materials utilization offering the highest potential is in development of glass-ceramic compositions, where the waste is melted to form a glass, fabricated using conventional glass forming techniques, and subsequently nucleated and devitrified in a controlled manner through heat treatment. The resultant, partially crystallized material offers improved strength, chemical and abrasion resistance.

Copper mine tailings were mixed with 30% glass cullets and melted in electric furnace BLF 17/3 at  $T=1450$  °C during  $t=0.5$  h. The obtained glass sample was black, without visible residual gas bubbles. X-ray powder diffraction (XRD) analysis confirmed the quenched melt to be amorphous. DTA and HSM analysis were performed on the previously prepared glass powder. The glass powder samples were pressed in pellets and sintered in an electric furnace at the temperature of 1040 °C for 2h and glass- ceramics were obtained.

Applications for these glass-ceramic materials would include structural products, pipe or pipelines to transport abrasive or corrosive fluids, alkali-resistant fibers to replace asbestos in concrete products, and use as a matrix material in which radioactive wastes could be chemically incorporated in a stable, non-leachable, solid form.

**Keywords:** glass, glass- ceramics, mine tailings.