



**Serbian Ceramic Society Conference**  
**ADVANCED CERAMICS AND APPLICATION XI**  
**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, 18-20. September 2023.**

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**Book title:** Serbian Ceramic Society Conference - ADVANCED CERAMICS AND APPLICATION XI Program and the Book of Abstracts

**Publisher:**

Serbian Ceramic Society

**Editors:**

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Dr. Lidija Mančić

**Technical Editors:**

Dr. Adriana Peleš Tadić

Dr. Jelena Živojinović

**Printing:**

Serbian Ceramic Society, Belgrade, 2023.

**Edition:**

120 copies

CIP - Каталогизacija у публикацији  
Народна библиотека Србије, Београд

666.3/.7(048)

66.017/.018(048)

**SRPSKO keramičko društvo. Conference Advanced Ceramics and Application : New Frontiers in Multifunctional Material Science and Processing (11 ; 2023 ; Beograd)**

Program ; and the Book of abstracts / Serbian Ceramic Society Conference Advanced Ceramics and Application XI New Frontiers in Multifunctional Material Science and Processing, Serbian Academy of Sciences and Art Serbia, Belgrade, 18-20. September 2023. ; [editors Nina Obradović, Lidija Mančić]. - Belgrade : Serbian Ceramic Society, 2023 (Belgrade : Serbian Ceramic Society). - 90 str. : ilustr. ; 30 cm

Tiraž 120.

ISBN 978-86-905714-0-6

a) Керамика -- Апстракти б) Наука о материјалима -- Апстракти

COBISS.SR-ID 122849545



Dear colleagues and friends,

We have great pleasure to welcome you to the Advanced Ceramic and Application XI Conference organized by the Serbian Ceramic Society in cooperation with the Institute of Technical Sciences of SASA, Institute of Chemistry Technology and Metallurgy, Institute for Technology of Nuclear and Other Raw Mineral Materials and Institute for Testing of Materials.

It is nice to host you here in Belgrade in person. We are very proud that we succeeded in bringing the scientific community together again and fostering the networking and social interactions around an interesting program on emerging advanced ceramic topics. The chosen topics cover contributions from fundamental theoretical research in advanced ceramics, computer-aided design and modeling of new ceramics products, manufacturing of nano-ceramic devices, developing of multifunctional ceramic processing routes, etc.

Traditionally, ACA Conferences gather leading researchers, engineers, specialists, professors and PhD students trying to emphasize the key achievements which will enable the widespread use of the advanced ceramics products in the High-Tech industry, renewable energy utilization, environmental efficiency, security, space technology, cultural heritage, etc.

Serbian Ceramic Society was initiated in 1995/1996 and fully registered in 1997 as Yugoslav Ceramic Society, being strongly supported by American Ceramic Society. Since 2009, it has continued as the Serbian Ceramic Society in accordance with Serbian law procedure. Serbian Ceramic Society is almost the only one Ceramic Society in South-East Europe, with members from more than 20 Institutes and Universities, active in 9 sessions..

Dr. Nina Obradović  
*President of the Serbian Ceramic Society*

Dr. Suzana Filipović  
*President of the General Assembly of the Serbian Ceramic Society*

### Conference Topics

- Basic Ceramic Science & Sintering
- Nano-, Opto- & Bio-ceramics
- Modeling & Simulation
- Glass and Electro Ceramics
- Electrochemistry & Catalysis
- Refractory, Cements & Clays
- Renewable Energy & Composites
- Amorphous & Magnetic Ceramics
- Heritage, Art & Design

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Turistička organizacija Beograda, Inovacioni centar Mašinskog fakulteta,

Institut za ispitivanje materijala,

Institut za tehnologiju nuklearnih i drugih mineralnih sirovina

eggshell powder. Under the same conditions as bio-waste cement, limestone cement clinker was also synthesized. Instrumental tests (X-ray diffraction, scanning electron microscopy, differential scanning calorimetry, and thermogravimetry analysis) were employed to analyze the mineral phases in the produced cements. The results showed that eggshell-cement had four major cement clinker phases ( $C_3S$ ,  $C_2S$ ,  $C_3A$ , and  $C_4AF$ ) that were identical to those in ordinary commercial Portland cement. As a result, this study demonstrated that it is possible to recycle eggshell waste to partially substitute limestone as a raw material for cement clinker manufacturing.

**Acknowledgements:** This investigation is supported by The Ministry of Science, Technological Development and Innovation (contract number: 451-03-47/2023-01/ 200012)

## P39

### Mechanical properties of zirconium diboride ceramics

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Zirconium diboride ( $ZrB_2$ ) belongs to the group of ultrahigh temperature ceramics (UHTCs) because of its high melting point (3250°C). Due to its excellent properties, such as the melting temperature, high strength and hardness, high thermal and electrical conductivities relative to other ceramics and good corrosion resistance to molten metals, it has attracted great interest from materials scientists. Fully dense  $ZrB_2$  ceramics were successfully obtained by hot pressing at 2150°C for 10 minutes. Prior to hot pressing, commercially available  $ZrB_2$  powder was ball milled for 24hr with  $ZrB_2$  media. Carbon was added as a densification aid in the amount of 0.5 wt.% using phenolic resin. For mechanical testing, three different methods were compared. Three point bending was performed in air at room temperature and the obtained strength was 546±55 MPa. Four-point bend strengths were measured under same conditions resulting in strengths of 476±112 MPa. Finally, the fracture toughness of pure  $ZrB_2$  ceramics was determined by the chevron notched beam method to be  $4.1 \pm 0.5 \text{ MPa}\cdot\text{m}^{1/2}$ . The obtained results of mechanical testing make this ceramic material applicable as cutting tools, and parts for hypersonic aerospace vehicles.