



Serbian Ceramic Society Conference
ADVANCED CERAMICS AND APPLICATION X
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, 26-27. September 2022.

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Dear colleagues and friends,

We have great pleasure to welcome you to the Advanced Ceramic and Application X 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. This Conference is dedicated to Prof. Dr. Vojislav Mitić, president of Serbian ceramic society, who passed away in September 2021.

It is nice to host you here in Belgrade in person. As you probably know, Serbia launched a vaccination campaign at the beginning of last year, so up to date more than 70 percent of the adult population has been vaccinated. Since there is no one statistic to compare the COVID19 outbreaks and fears for loved ones in different countries, we believe that we all suffer similarly during this pandemic. That is why we appreciate even more your positive attitude and readiness to travel in this uncertain time. We deeply hope that the ACA X Conference will be worth remembering, that you will respect all COVID-19 safety measures at SASA building, that you will have a nice time here and that ultimately you will return to your home safely. 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. Part of our members are also members of the Serbian Chapter of ACerS since 2019. Their activities in the organization of this conference is highly recognized. To them and all of you thanks for being with us here at ACA X.

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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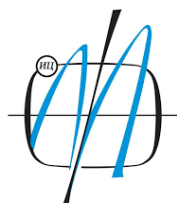
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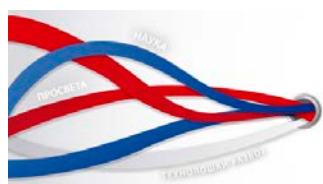
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PL2

Zeta phase tantalum carbide: a high strength, high toughness ceramic

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Zeta-phase carbides have an unusual combination of strengths above 500 MPa and fracture toughness values exceeding $10 \text{ MPa}\cdot\text{m}^{1/2}$. These ceramics have a narrow range of compositional stability and typically decompose to other carbides when heated above a critical temperature. In the tantalum-carbon system, the zeta phase is stable below $\sim 2400^\circ\text{C}$ with a tantalum to carbon ratio of about 3 to 2. Room temperature strength and fracture toughness values had previously been reported. Recent research in our laboratory utilized reaction-based processing to produce zeta phase tantalum carbide ceramics that were nearly fully dense and contained up to $\sim 96 \text{ wt\%}$ of the zeta phase. These ceramics exhibited metallic conductivity with electrical resistivity of $\sim 160 \text{ ohm}\cdot\text{cm}$ at room temperature. The thermal conductivity was about $10 \text{ W/m}\cdot\text{K}$, which is about $1/3$ of the value of TaC. At elevated temperatures, the strength decreased from about 700 MPa at room temperature to about 180 MPa at 1600°C while the fracture toughness decreased from about $10 \text{ MPa}\cdot\text{m}^{1/2}$ to $5 \text{ MPa}\cdot\text{m}^{1/2}$ over the same temperature range. Based on its unusual mechanical behavior, zeta-phase tantalum carbide can be machined using conventional hardened steel tools. The presentation will discuss the mechanisms underlying these interesting properties.

PL3

Alumina as electrode material

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Alumina (aluminium oxide or Al_2O_3) is one of the well-known ceramic materials. This material is widely used as abrasives, in the production of refractory products and glass, advanced ceramics, medical applications, and military and electronics applications. It is also used as a catalyst and/or catalyst support for various catalytic reactions. Alumina found its various applications in the field of electrochemistry as well: as solid electrolyte, anodic membrane, and corrosion coatings are the most prominent of them.

Most intriguingly, alumina although known as an insulating material, is also used as the electrode material. In recent years it was noticed that the properties of the glassy carbon electrode were enhanced after polishing the electrode with γ -alumina. The morphology and structure of Al_2O_3 particles used for the electrode polishing influenced electrode performances. The investigations were continued with the alumina applied at the surface of the electrode. Strong apparent catalysis of the catechol redox process was noticed in the presence of alumina on the electrode surface leading to the conclusion that the alumina on the electrode surface can act as a catalyst for oxidative process involving a proton-coupled electron-transfer process.