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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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

Poster Session I (P1-P13) Club SASA 19th September, 17.20-19.00

P1

Laser-induced graphene on PEO/PDMS composites

Marija V. Pergal[1], Milena Rašljić-Rafajilović[1], Teodora Vićentić[1], Igor Pašti[2], Danica Bajuk-Bogdanović[2], Katarina Radulović[1], Marko Spasenović[1]

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Laser-induced graphene (LIG) has emerged as one of the most promising materials for flexible functional devices. One-step fabrication of LIG offers advantages such as low cost, patterning of desired geometries, and high sensitivity. However, previous attempts to obtain LIG on elastomeric substrates have been unsuccessful, limiting its potential for use in stretchable electronics. In this study, we propose using a substrate composed of polydimethylsiloxane (PDMS) and poly(ethylene oxide) (PEO) with a low molecular weight as a platform for manufacturing LIG. A series of PDMS/PEO materials with varying concentrations of PEO (1, 5, 10, 20, 30, 40 and 50 wt.%) were prepared using a cast-based approach, starting from divinyl-terminated-PDMS and poly(methyl-hydrogensiloxane). The prepared PDMS/PEO/graphene composites were characterized using Raman spectroscopy, Fourier transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM) analysis. FTIR analysis confirmed the structure of the prepared PDMS/PEO and PDMS/PEO/graphene materials. The results demonstrated that the prepared PDMS/PEO composites exhibited a higher degree of graphenization compared to pure PDMS networks. SEM analysis revealed the formation of a porous graphene structure. Based on these findings, the PDMS/PEO/graphene composites show promise for further investigation as electronic device applications.

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P2

Structural and thermal properties of PDMS/Triton/laser-induced graphene composites

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Laser-induced graphene (LIG) has recently been proposed as a viable option for fabricating various types of flexible electronic devices due to its excellent mechanical stability and electrical properties. During laser induction of graphene on polymers, the high temperature generated with the laser breaks C-O, C=O, and N-C bonds in polymers, leading to the recombination of C and N atoms. Additionally, the rapid release of carbonaceous and nitric

gases results in the formation of 3D porous structures. This approach offers a one-step, chemical-free synthesis method for producing porous graphene on polymer surfaces. Moreover, it is a fast and cost-effective technique that is ideal for flexible electronics and energy storage devices. In this study, graphene was formed on a poly(dimethylsiloxane) (PDMS)/Triton substrate with varying concentrations of Triton (1-30 wt.%) using CO_2 laser irradiation. The effects of Triton content on the structural, thermal, and surface characteristics of PDMS/Triton and PDMS/Triton/graphene materials were investigated. The prepared PDMS/Triton/graphene materials were thoroughly examined using X-ray diffraction analysis (XRD), thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), and water contact angle analysis. XRD analysis confirmed the presence of graphene in the material. The thermal and surface properties of the proposed materials can be easily adjusted by manipulating the Triton concentration. The hydrophilicity of the prepared PDMS/Triton materials increased compared to pure PDMS, which is hydrophobic. It was found that the success of LIG formation depends on Triton content, increasing with higher concentration of Triton in the PDMS matrix. The presented results aim to address the existing challenges associated with stretchable polymers suitable for flexible electronic device applications.
Acknowledgement: The authors would like to thank the Ministry of Science, Technological Development, and Innovation of Republic of Serbia (Contract No: 451-03-47/2023-01/200026).

P3
Lime based mortars: compositional and microstructural compatibility for use in restoration

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Lime-based mortars are one of the mostly applied materials through construction history. Since the possibilities of acquiring mortar samples for testing from the historical site locations are very restrict, it was necessary to involve different techniques for the characterization of original mortars, from chemical, mineralogical and microstructural point of view. Similarly, for the characterization of the newly prepared mortars intended for restoration purposes, same testing methods are proposed. In this work some of the testing techniques that show potential in this area are presented, emphasizing their strong points and weaknesses. Laboratory-prepared lime mortars, were tested using FTIR, TG-DTA, XRF, XRD, MIP, SEM-EDX and Raman Spectroscopy, before and after exposure to the action of soluble salts. Peaks positioned at 3640 cm^{-1}, 875 cm^{-1} and 1418 cm^{-1}, measured by FTIR, are good indicators of presence of portlandite ($Ca(OH)_2$) and calcium carbonate, respectively. Similarly, TG-DTA peaks around 480 ºC and between 600 ºC and 800 ºC also indicate their presence, with the possibility of quantitative evaluation. Quantifying the presence of soluble salts was performed using XRF measurements. Distribution of the salts and reaction products between salts and mortar matrix was analyzed using SEM images. In some cases, type of reaction products, were registered using Raman Spectroscopy. Unexpectedly, they were not detected through XRD analysis. According to performed analyses tested mortars show good potential as restoration materials.