INSTITUTE OF TECHNICAL SCIENCES OF SASA
MATERIALS RESEARCH SOCIETY OF SERBIA

Programme and the Book of Abstracts

TWENTIETH YOUNG RESEARCHERS' CONFERENCE MATERIALS SCIENCE AND ENGINEERING

Belgrade, November 30 – December 2, 2022

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Aim of the Conference

Main aim of the conference is to enable young researchers (post-graduate, master or doctoral student, or a PhD holder younger than 35) working in the field of materials science and engineering, to meet their colleagues and exchange experiences about their research.

Topics

Biomaterials
Environmental science
Materials for high-technology applications
Materials for new generation solar cells
Nanostructured materials
New synthesis and processing methods
Theoretical modelling of materials

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Results of the Conference

Beside printed «Programme and the Book of Abstracts», which is disseminated to all conference participants, selected and awarded peer-reviewed papers will be published in journal "Tehnika – Novi Materijali". The best presented papers, suggested by Session Chairpersons and selected by Awards Committee, will be proclaimed at the Closing Ceremony. Part of the award is free-of-charge conference fee at YUCOMAT 2023.

Sponsors

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Synthesis and characterization of dental inserts based on calcium-phosphate, doped with magnesium, strontium and fluorine ions

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Bioceramic materials based on calcium-hydroxyapatite (HAp), due to their bioactive properties, chemical composition, excellent biocompatibility and good mechanical properties play a very important role in the manufacture of implants for orthopedic, dentistry and maxillofacial surgery. After installation, dental inserts are in the central part of restauration of the teeth. It is necessary to synthesize a biocompatible material that would find application in dentistry as a substitute for dentin. The aim of this work is to process, characterize and test the mechanical properties of synthesized dental inserts. Hydroxyapatite powder was synthesized and doped by hydrothermal method. The content of doped Mg and Sr ions in all cases was 3 mol. % related to calcium, while the content of F ions in the powders were 0.5, 1 and 2 mol. %. Energy dispersive spectroscopy confirmed the proportion of doped F ions in the synthesized powders was 0, 0.24 and 1.34 at. %, respectively. The Ca/P molar ratio in the powders was 1.16, 1.17 and 1.18 respectively, which indicates calcium-deficient powders. The inserts were pressed with a uniaxial press at 100 MPa and further by isostatic press at 400MPa and sintered at 1200 °C for 2 hours. X-ray diffraction analysis of the sintered materials showed the presence of both, HAp and β-tricalcium phosphate. Scanning electron microscopy was used to examine the microstructure of controlled porous inserts and the morphology of nanostructured powders. Particles have similar dimensions and needle structure. While examining the microstructure of the inserts, it was noticed that increasing in the amount of F ions, affected the increase in the number and size of micron sized pores, which was reflected on their mechanical properties. Examining the hardness and fractured toughness of the inserts, showed that with an increase in the proportion of F ions, the hardness of the inserts decreased, while the proportion of F ions has no significant effect on the fracture toughness. It was shown that fluoride ions have a significant effect on the properties of the obtained macroporous biomaterials, which indicate their potential for use in dentistry.

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