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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Mechanical properties and bioactivity of scaffolds based on calcium-phosphates doped with Mg^{2+}, Sr^{2+} and F^- ions and coated with chitosan

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Human bones contain calcium-phosphate crystals as the main inorganic component. Small amounts of various cations and anions can be incorporated into hydroxyapatite (HAp) during synthesis and affect their microstructure, mechanical and biological properties mimicking the properties of normal biological tissues. The aim of this research was the synthesis and examination properties of bioceramic scaffolds based on Hap doped with strontium, magnesium and fluorine ions, uncoated and coated with polymer chitosan. The influence of dopedF ions and chitosan on the properties of bioceramic scaffolds was also investigated. HAp powders were synthesized and doped by hydrothermal process. The content of Mg and Sr doping ions was constant in amount of 3 mol. % related to calcium, while the content of F ions was 0.5, 1 and 2 mol. %. Powder with 1 mol. % F was calcined at a temperature of 1000 °C for 2 hours. The sponge replica method was used to obtain scaffolds. The scaffolds were subsequently coated with a thin layer of chitosan. The elemental analysis of the synthesized powders was determined by energy dispersive spectroscopy (EDS). EDS confirmed the presence of doping Mg and Sr, while the amount of doping F ions was 0, 0.24 and 1.34 at. %, respectively. X-ray diffraction analysis determined the phase composition of the powders and scaffolds, which showed the presence of HAp and additionally β-tricalcium phosphate phase in scaffolds. In the compressive strength (CS) test, the synthesized scaffolds had maximum CS of 14.6kPa, while the chitosan-coated scaffolds reached CS of 145.9 kPa. Bioactivity was investigated by keeping the scaffolds in simulated body fluid for28 days. Scanning electron microscopy was used to examine the morphology of nanostructured powders, microstructures of macroporous scaffolds and the bioactivity of the scaffolds. The uncoated scaffolds showed satisfactory bioactivity. Lower bioactivity occurred in coated scaffolds due to the slow degradation of the chitosan. It was observed that the addition of F ions and chitosan polymer resulted in significant changes to the properties of the synthesized scaffolds, which indicates their potential application in tissue engineering and controlled drug release.

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