11TH CONFERENCE
FOR YOUNG SCIENTISTS IN CERAMICS

Satellite event:
ESR COST IC1208 Workshop

BOOK OF ABSTRACTS

October 21-24, 2105
Faculty of Technology
Novi Sad, Serbia

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PROGRAMME
and
BOOK OF ABSTRACTS

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action of centrifugal force. Subsequently the samples were dried and sintered in reducing atmosphere.

In order to investigate the stability of slurries the sedimentation study were performed for slips with different sold content. Microstructural observation and EDS analysis performed the distribution of metallic particles in ceramic matrix. Quantitative description of the microstructure of the graded region in the composites was made based on SEM images using computer analysis.

The research showed that the gradient composite affects both speed used in the centrifugal process and the solid content in the slurry.

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RESORBABLE BIOCERAMICS IN $Ca_3(PO_4)_2$–$Mg_2P_2O_7$ SYSTEM

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Composite materials containing phases of tricalcium phosphate $Ca_3(PO_4)_2$ (TCP) and/or hydroxyapatite $Ca_{10}(PO_4)_6(OH)_2$ (HA) have been approved and authorized for clinical use in the most countries of the world. The main advantages of these materials consist in good biocompatibility and osteoconductivity in vivo. Chemical composition of ceramic materials based on HA and TCP are very similar to those of bones of animals and humans. These materials are not toxic and they do not cause allergic reactions. However, they have the following disadvantages: low speed of bioresorption, weak stimulatory effect on the growth of new bone tissue (osteoinduction), low fracture toughness and low fatigue strength under physiological conditions.

Being integrated into the lattice of hydroxyapatite bone tissue magnesium ion is an important factor for bone metabolism, for the bone matrix formation and its mineralization. It can also affect the activity of osteoblasts and osteoclasts, i.e. the rate of bone growth. Manmade ceramic material preparing based on calcium and magnesium phosphates can be an active source of chemical elements, which are essential for the new bone formation. The enhancement of the bioactivity of calcium phosphate ceramics can be achieved by adding the magnesium phosphate.

The aim of our research activity was to obtain resorbable bioceramic in $Ca_3(PO_4)_2$-$Mg_2P_2O_7$ system, based on synthetic powders of calcium and magnesium phosphates. The selection of various calcium and magnesium salts as initial ingredients allowed us to control a predetermined pH level in the reaction zone. Fine calcium and magnesium phosphate powders were synthesized by means of wet precipitation from aqueous solutions of ammonium hydrogenphosphate and calcium and magnesium nitrates/ acetate/ saccharates. The phase composition of synthetic powders was presented with the calcium and magnesium phosphates, i.e. HA - $Ca_{10}(PO_4)_6(OH)_2$, struvite -

$MgNH_4PO_4(H_2O)_6$, or a mixture of HA and struvite. The content of struvite increased with increasing magnesium content of the initial solution. Samples molded from synthetic powder were fired with a heating rate of 5 °C/min, holding for 2 hours at a final temperature in the range 900–1200 °C. According to XRD analysis the phase composition of ceramic materials, was consisted of tricalcium phosphate, magnesium pyrophosphate, solid solutions of calcium/magnesium orthophosphate and calcium/magnesium pyrophosphate.

The obtained ceramic materials can be used for regeneration of damaged bone tissue.

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IMPROVED PROPERTIES OF THE EPOXY-FLY ASH COMPOSITES BY SILANE TREATMENT OF THE FILLER

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Epoxy resin and its composites are widely used in many fields, for example: automotive, aerospace, construction or electronics. Properties of epoxy materials can be improved by filling resin matrix with fillers. Different branches of industry use different fillers in epoxy resin systems in order to get composites with the enhanced parameters. Quartz powder is one of the most popular epoxy resin filler. In the presented research work, the possibility of a quartz flour replacement by fly ash was investigated. Due to lower viscosity the processing of the fly ash composite is easier, e.g. filling of the mold. However, properties of fly ash composite such as mechanical properties and thermal conductivity, are inferior to that obtained on standard system with quartz powder. Therefore, in order to improve this two parameters with fly ash as a filler, the fly ash particles were modified by a silanization process. Four different conditions of silanization process and two different concentrations of the silane were performed. The presence of silane on the surface of fly ash particles was confirmed by two characterization methods: Infrared Spectroscopy (FTIR) and Scanning Electron Microscopy (SEM). The set of samples based on the epoxy resin composites filled with modified particles was prepared. The properties of samples were investigated by means of mechanical tests, such as tensile strength and fracture toughness. Also the thermal conductivity measurements were performed on the prepared composites. The enhancement of the tested parameters was observed for all the epoxy resin samples filled with the modified fly ash in comparison to epoxy resin filled with untreated fly ash. The obtained results show possibility of application of the functionalized fly ash in epoxy composites used in industrial systems.