The Serbian Society for Ceramic Materials

Institute for Multidisciplinary Research (IMSI), University of Belgrade

Institute of Physics, University of Belgrade

Center of Excellence for the Synthesis, Processing and Characterization of Materials for use in Extreme Conditions "CEXTREME LAB" - Institute of Nuclear Sciences "Vinča", University of Belgrade

Faculty of Mechanical Engineering, University of Belgrade

Center of Excellence for Green Technologies, Institute for Multidisciplinary Research, University of Belgrade

Faculty of Technology and Metallurgy, University of Belgrade

PROGRAMME and the BOOK of ABSTRACTS

6CSCS-2022

6th Conference of the Serbian Society for Ceramic Materials
June 28-29. 2022. Belgrade Serbia

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Branko Matović
Aleksandra Dapčević
Vladimir V. Srdić

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O-2

THE INFLUENCE OF HYDROTHERMAL SYNTHESIS TEMPERATURE OF MAGNESIUM DOPED HYDROXYAPATITE ON ITS APPLICATION AS DENTIN SUBSTITUTE

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The needle-like morphology of hydrothermally obtained nanosized hydroxyapatite powders mimics biological apatite, the main mineral component of human bones and teeth. Since the apatite in nature contains many impurities in its structure, such as Mg^{2+}, Sr^{2+}, Cu^{2+}, F^{-}, etc. the ion-doping approach has been proposed as a possible path for mimicking the mineral component of hard tissue for bone and teeth tissue repair and regeneration. Previously, the undoped hydroxyapatite-based compacts were shown to be adequate dentin substitutes for application in restorative dentistry.

The aim of this study was to analyze the influence of synthesis temperature during hydrothermal synthesis of nanosized hydroxyapatite powder doped with Mg ions (Mg-HAP) on the application of Mg-HAP sintered ceramics as dentin substitutes. The Mg-HAP powder was synthesized in the range of temperatures 150–180 °C, pressed into compacts and further sintered at 1200 °C. The physico-chemical and mechanical properties of obtained sintered ceramics, as well their bonding ability with commercially available dental restorative materials (composites, cements and adhesives) were tested.

The results showed that synthesis temperature does not influence the phasic composition of the obtained nanopowders, which were all shown to be monophasic hydroxyapatite. However, it did have influence on the phasic composition, densification, and mechanical properties of the sintered materials. The obtained Mg-HAP ceramics with controlled porosity were shown to have satisfactory mechanical properties (hardness by Vickers in the range 3.78–4.73 GPa, fracture toughness in the range 0.93–1.12 $MPa \cdot m^{1/2}$) and adequate bonding ability with dental materials for application in restorative dentistry as dentin substitutes. Nevertheless, it was shown that even 10 °C difference in synthesis temperature of Mg-HAP powders influenced greatly the bonding ability of the dentin substitutes with the restorative

materials, due to the differences in phasic composition, solubility and mechanical properties.

O-3

INFLUENCE OF Yb^{3+} CONCENTRATION ON STRUCTURAL AND LUMINESCENT PROPERTIES OF Tm^{3+} DOPED $SrGd_2O_4$

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Here, samples of $SrGd_2O_4$ doped with different concentration of Yb^{3+} (2, 4, 6 at.%) ions and constant concentration of Tm^{3+} (1 at.%) were prepared. For preparation of samples, combustion method assisted with glycine as a fuel and citric acid as a chelator was chosen. All samples were heated in the furnace at 500 °C for 1.5 h and additionally thermally treated for 2.5 h at 1000 °C. X-ray diffraction (XRD) revealed that all peaks are assigned to the pure orthorhombic lattice of $SrGd_2O_4$, space group *Pnma* (JCPDS Card No.:01-072-6387). Field emission scanning electron microscopy (FE-SEM) showed agglomerated spherical particles with size around 150 nm. Energy dispersive spectroscopy confirmed uniform distribution of constitutive elements through the samples. Up-conversion emission properties were evaluated from photoluminescent emission spectra and intensity dependence on excitation power after excitation at 980 nm. Dominant blue emission with appropriate transition $^1G_4 \rightarrow {}^3H_6$ is detected in all samples, for which three photons are required.