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YUCOMAT 2018

Herceg Novi, Montenegro, September 3–7, 2018

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TWENTIETH ANNUAL CONFERENCE

YUCOMAT 2018

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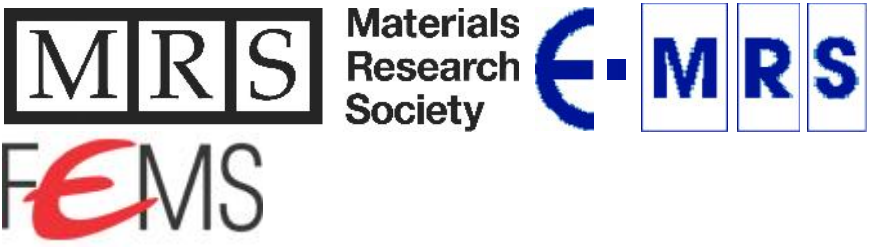

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Rare earth dual-doped multifunctional hydroxyapatite particles for potential application in preventive medicine

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Composite biomaterials based on nano hydroxyapatite (HAp) are the subject of numerous studies in reconstructive medicine. Multifunctional and nanoparticulate systems based on HAp and biodegradable polymers are successfully designed as systems for controlled and systemic drug delivery suitable for use in reconstructive medicine. Thanks to the stability and flexibility of the apatite structure, Ca ions can be replaced with various elements (Zn, Sr, Mg, Co, etc.). Doping the apatite structure enables potential application of this material in preventive medicine, too. Multimodal imaging (MI) is a new and promising technique for improved diagnosis and it is patient-friendly because it saves time. MI has recently attracted much attention due to the advantageous combination of various imaging modalities, such as computer tomography (CT), photoluminescence (PL) and magnetic resonance imaging (MRI). For such a promising approach, we devised new multimodal contrast agents using the doping of a HAp matrix with rare earth (RE) ions.

Pure HAp ($Ca_5(PO_4)_3(OH)$), magnetic HAp:Gd ($Ca_{4.85}Gd_{0.15}(PO_4)_3(OH)$), down-converting HAp:Gd,Eu ($Ca_{4.94}Gd_{0.02}Eu_{0.04}(PO_4)_3(OH)$) and up-converting HAp:Gd,Yb/Tm ($Ca_{4.85}Gd_{0.03}Yb_{0.1}Tm_{0.02}(PO_4)_3(OH)$) were synthesized using a hydrothermal procedure. Morphological and structural characteristics of the particles were obtained using X-ray powder diffraction (XRPD), scanning and transmission electron microscopy (SEM/TEM), energy dispersive X-ray spectrometry (EDX), photoluminescence (PL), Fourier Transform Infrared (FTIR) and diffuse reflectance spectroscopy (DRS). The results show that needle-like nano- or microparticles were obtained in all systems. Their phase composition and uniform distribution of dopants were confirmed by the structural refinement of the XRPD data, change in the band gap, and luminescence spectra recorded using different excitation sources (λ= 370, 394 and 977 nm).

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