Book of abstracts

V School for young scientists

Magnetic Resonance and Magnetic Phenomena in Chemical and Biological Physics

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Poster 23

EPR study of powders of the doped tricalcium phosphate and hydroxyapatite

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A field of my interest at present is an investigation of powders and nanosized powders of synthetic hydroxyapatite (HA, $Ca_{10}(PO_4)_6(OH)_2$) and tricalcium phosphate (TCP, $Ca_3(PO_4)_2$) doped with various ions in different concentrations using X-band EPR. HA and TCP are the most important biomaterials widely used in dentistry and orthopedics, to restore bone defects and as materials for coating metal implants [1]. HA and TCP are non-toxic, have high biocompatibility, osteoconductivity, good mechanical properties, etc. [2]. These properties could be tuned by doping the species by metal cations The goal of the modern material (medical) science – to create multifunctional, personalized materials by using HA, TCP and their mixture as matrices.

We have investigated Mn^{2+} doped HA and TCP powders with the manganese concentration in the range 0-5 mol %. The main parameters of the spin Hamiltonian $\hat{H} = g\beta H_0\hat{S} + D^*(S^2_z - S^*(S+1)/3) + E^*(S^2_x+S^2_y) + A\hat{I}\hat{S}$ [3] were determined (g-factor, zero-field parameters D and E of the axial crystal field, the value of the isotropic hyperfine interaction A_{iso}). Exchange narrowing with concentration was revealed. The corresponding coefficients of the exchange interaction were calculated. EPR lineshapes were approximated. Intensive signals with the resolved hyperfine structure at $g \approx 4.8$ and $g \approx 10$ are observed which may be due to the presence of different, structurally nonequivalent positions for Mn^{2+} ions for Ca^{2+} substitution in HA and TCP structures [3]. Additional experimental studies are needed to describe the powder spectra and structures at $g \approx 4.8$ and $g \approx 10$.

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