

The morphology of fluorapatite-gelatine nanocomposites follows a fractal growth mechanism, in which elongated hexagonal seed units first develop into dumb-bell shaped aggregates and ending in notched spheres.

In order to investigate the dependence of the morphology of the aggregates on the initial fluoride amount, a series of experiments was performed where the fluoride concentration was varied and calcium / phosphate concentrations were kept constant (Ca:P:F = 5:3:x, $0.46 < x < 1$). The apatite-gelatine nanocomposites were investigated by means of SEM for their morphology and by X-ray powder diffraction for their crystal structure. While the aggregates preserved the fractal growth mechanism with decreasing fluoride content, a significant change in the morphology of the particles was observed. In fluoride deficient aggregates, the hexagonal seed crystals and the outgrowing branches (Fig. 1), which show self-similarity to the hexagonal seed, became less dense with the subunits exhibiting different thicknesses compared to fluoride-rich aggregates [1]. Decrease in the amount of fluoride was also followed by their X-ray powder diffraction patterns, in which a shift in 2-theta to smaller angles was observed indicating an increase in lattice parameters via substitution of hydroxide ions by fluoride ions. Further experiments to investigate the microstructure and the organization of organic fibrils within the composite by means of FIB/TEM, and the chemical composition by means of chemical analyses are in progress. Although similar experiments were reported in literature [2], a fractal morphogenesis of apatite-gelatine aggregates is observed for the first time.

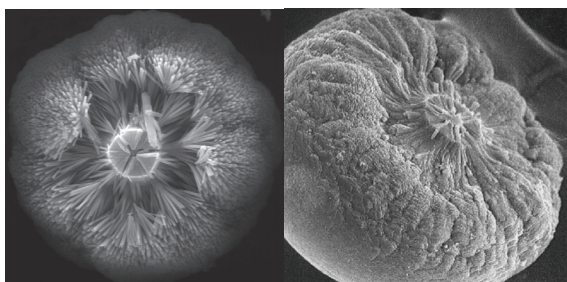


Figure 1. SEM images of broken dumbbells of a) fluoride deficient b) fluoride rich apatite-gelatine composite aggregates. Scale bar 10 μ m.

[1] Kniep R., Simon P., *Top. Curr. Chem.*, **2007**, 270, 73-125.

[2] Göbel C., Simon P., Buder J., Tlatlik H., Kniep R., *J. Mater. Chem.*, **2004**, 14, 2225

Keywords: biomineralization; apatite; gelatine composite

FA2-MS02-P14

Crystal Structure of ZnWO₄ (sanmartinite) Scintillator Material in the Range of 3–1423 K. Dmytro M. Trots^a, Anatoliy Senyshyn^b, Leonid Vasylechko^c. ^aHASYLAB at DESY, Notkestr. 85, 22607 Hamburg, Germany. ^bTechnische Universität Darmstadt, FB Material- und Geowissenschaften, Fachgebiet Strukturforchung, Petersenstr. 23, D-64287 Darmstadt, Germany. ^cLviv Polytechnic

National University, Bandera St. 12, 79013 Lviv, Ukraine.

E-mail: dmytro.trots@desy.de; Anatoliy.Senyshyn@frm2.tum.de

The continuous interest in zinc tungstate (sanmartinite) arises from its good scintillation properties. Recent interest in ZnWO₄ is motivated by its excellent prospect in experimental searches for rare events. Since a cryogenic detector has to be cooled down to very low temperatures, information about the thermal expansion of ZnWO₄ is crucial with respect to the thermo-mechanical compatibility with other components of the detector.

Structure of ZnWO₄ (wolframite structure type at room temperature, *P2/c*) was investigated over range of 3–1423 K using synchrotron (B2@HASYLAB [1]) and neutron powder diffraction (SPODI@FRMII [2]). No phase transitions were detected up to the melting point. The low temperature evolution of the ZnWO₄ lattice volume can be modelled fairly well in framework of the 1st order Gruneisen approximation with a Debye approximation for the internal energy [3]. Despite the simplicity of this parameterization, implying a temperature-invariant γ and K , the Debye temperature (370(6) K) and the bulk modulus (161(3) GPa) estimated from this description of the lattice expansion agree well within reasonable limits with the literature values, thus giving strong support for the suitability of the model for ZnWO₄ [3].

The anisotropy of the low temperature thermal expansion is apparent for ZnWO₄. Equality of $\alpha_{11}(T)$ and $\alpha_{22}(T)$ is readily attributed to the features of the ZnWO₄ structure: each chain of ZnO₆ octahedra is corner-linked in the *x-y* plane to four chains of WO₆ octahedra and *vice versa*, *i.e.*, the isotropic expansion in the *x-y* plane can be explained by equivalent corner linkages between rigid octahedral units in the $\langle 110 \rangle$ directions. The expansion along the *c*-axis – the direction where zigzag chains are formed by either edge-sharing ZnO₆ or edge-sharing WO₆ octahedra – is lower than along the *a*- and *b*- directions. The minimum of expansivity corresponds to the direction where more rigid edge-sharing linkages of ZnO₆ or WO₆ octahedra occur. Thus, it is demonstrated how the pronounced anisotropic behaviour in the expansivity of ZnWO₄ can be attributed to the specific structural features [3].

[1] Knapp, M. et al. *J. Synchrotron. Radiat.*, **2004**, 11, 328. [2] Hoelzel, M. et al. *Neutron News*, **2007**, 18, 23. [3] Trots, D. et al. Submitted to *J. Phys.: Condens. Mat.*

Keywords: scintillator materials; crystal structure; thermal expansion

FA2-MS02-P15

Synthesis and Characterization of New Fluorbritholites. A. Hassine^a, N. Jaba^b, K. Bouzouita^a.

^aU. R. Matériaux Inorganiques, Institut Préparatoire aux Etudes d'Ingénieurs, Rue Ibn ElJazzar, 5019 Monastir, Tunisie. ^bDépartement de Physique, Faculté des Sciences de Monastir, 5019 Monastir, Tunisie.

Email: amelhassine@yahoo.fr

Apatitic phosphosilicates, generally called “britholites”[1] have been the object of a great interest because of their potential use for the conditioning of nuclear wastes[2]. In the present work, neodymium-substituted strontium-fluorbritholites with the chemical formula $\text{Sr}_{10-x}\text{Nd}_x(\text{PO}_4)_6-x(\text{SiO}_4)_x\text{F}_2$, where $0 \leq x \leq 6$, were prepared by solid-state reaction at high-temperature. The prepared materials were characterized by X-ray diffraction, infrared spectroscopy, Raman spectroscopy and solid ^{31}P Nuclear Magnetic Resonance.

The results of X-ray diffraction analysis indicated that the obtained solid solution is limited with $0 \leq x \leq 2.5$.

The IR and Raman spectroscopies showed that the intensity of the absorption bands of PO_4^{3-} groups decreased, while that of the bands corresponding to SiO_4^{4-} groups increased confirming the incorporation of these latter groups into the apatite framework. Furthermore, ^{31}P NMR spectra exhibited one resonance peak indicating a single crystallographic site for the phosphor in the apatite structure.

[1] Felsche, J, *J. Solid State Chem.* 5, **1972**, 266. [2] Carpena. J, Lacout J. L., *Actual. Chim.* 2, **1997**, 3.

Keywords: britholites; apatite; nuclear magnetic resonance