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 lit erature [2], a fractal morphogenesis of apatite-gelatine aggregates is observed for the first time.

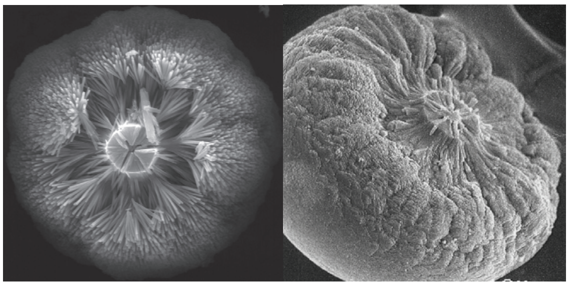

Figure 1. *SEM images of broken dumbbells of a) fluoride deficient b) fluoride rich apatite-gelatine composite aggregates. Scale bar 10µm.*

[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

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Crystal Structure of $ZnWO_4$ (sanmartinite) Scintillator Material in the Range of 3–1423 K.

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The continuous interest in zinc tungstate (sanmartinite) arises from its good scintillation properties. Recent interest in $ZnWO_4$ 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 $ZnWO_4$ is crucial with respect to the thermo-mechanical compatibility with other components of the detector.

Structure of $ZnWO_4$ (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 $ZnWO_4$ 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 $ZnWO_4$ [3].

The anisotropy of the low temperature thermal expansion is apparent for $ZnWO_4$. Equality of $\alpha_{11}(T)$ and $\alpha_{22}(T)$ is readily attributed to the features of the $ZnWO_4$ structure: each chain of ZnO_6 octahedra is corner-linked in the x-y plane to four chains of WO_6 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 <110> directions. The expansion along the c-axis – the direction where zigzag chains are formed by either edge-sharing ZnO_6 or edge-sharing WO_6 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 ZnO_6 or WO_6 octahedra occur. Thus, it is demonstrated how the pronounced anisotropic behaviour in the expansivity of $ZnWO_4$ 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

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Synthesis and Characterization of News Fluorbritholites.

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