

## Nanocomposites and nanomaterials

### Structural Features of Apatite-biopolymer Composites: the Comparison of X-Ray Diffraction and Scanning Electron Microscopy with Electron Diffraction

**V.M. Kuznetsov<sup>1</sup>, L.B. Sukhodub<sup>1</sup>, L.F. Sukhodub<sup>1</sup>, A.I. Kulak<sup>2</sup>**

<sup>1</sup> *Sumy State University. 2, Rymsky-Korsakov Str., Sumy-40007, Ukraine.  
E-mail: vkuznetsov.ua@gmail.com*

<sup>2</sup> *The Institute of General and Inorganic Chemistry. 9/1, Surganova Str.,  
Minsk-220072, Belarus.*

In most cases, it is impossible to study and describe the structure and properties of samples using a single method. That is why in our studies two research methods were used and compared – X-ray diffraction (XRD) and scanning electron microscopy with electron diffraction. Each method has certain advantages. In case of XRD – usability and more complex evaluation of the sample structural parameters. The advantages of the second one are the direct estimation of nanoparticle sizes and insignificant amount of the sample needed for the analysis. Such an approach allows determining sizes of crystallites and derived nanoparticles, and unit cell parameters even for the initial apatite, which cannot be done using other methods due to its low crystallinity and therefore the low separability of the diffraction lines, and the sizes of crystallites and derived nanoparticles.

The main direction of our work are the studies and the analysis of structural and substructural parameters of composite biomaterials based on an apatite and presented in the shape of fine-dispersed powders, pastes and gels.

The growing popularity of the use of the hydrogel-form biomaterials is obtained recently. The structure of the polymeric chains which establishes the three-dimensional gel net grants the possibility to immobilize and retain the enough quantity of water, biological liquid or medicine [1,2].

Nanoparticle sizes of the synthesized materials obtained using SEM differ significantly (almost 4 times larger) from the crystallite sizes calculated by the means of XRD in [0 0 c] crystallographic direction. Different additions to the composites lower the crystallinity level of the initial hydroxyapatite.

1. *Drury J.L., Mooney D.J.* Hydrogels for tissue engineering: scaffold design variables and applications // *Biomaterials*.-2003.-**24**.-P. 4337-4351.
2. *Mann B.K.* Biologic gels in tissue engineering // *Clin. Plast. Surg.*-2003.-**30**.-P. 601-609.