

# Nanochemistry and Nanobiotechnology

## Morphology and Electronic Structure of Nanoscale Powders of Calcium Hydroxyapatite

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During the last 20 years bioactive materials based on calcium hydroxyapatite with chemical composition and structure similar to that of mineral constituent of bone tissue are widely used in surgery. However, the problems of synthesis of nanodispersed calcium apatite with highly developed surface, which are the most similar to the morphology of particles of mineral component of bone, are still relevant [1-2].

In this work the morphological and physicochemical properties of calcium hydroxyapatite powders obtained by varying the temperature of synthesis parameters were investigated using atomic force microscopy, XPS, IR spectroscopy and NMR methods. The features of the morphology of calcium hydroxyapatite nanoparticles formation by varying the annealing temperature in the range 200-1000 °C was determined. For varying sizes of nanoparticles the obtained calcium hydroxyapatite powders at the last stage of synthesis washed in different organic substances: water, ethanol, acetone, glycerol, isopropanol.

The mechanism of crystal growth of calcium hydroxyapatite was investigated. It was established that the crystalline phase nucleation occurs in the amorphous matrix by clustering growth and subsequent coagulation with the formation of crystal grains in the wide range of dispersion. Temperature regime determines the kinetics of the structural transformation of the amorphous phase to the crystalline, -which in turn reflected on sub-structural features of structure of the particles. It was determined the influence of the size factor on the structural parameters of calcium hydroxyapatite, which appears in higher local symmetry of  $\text{PO}_4^{3-}$  tetrahedra in nanosized calcium hydroxyapatite.

1. *Karbinskyy V.L., Shpak A.P.* Apatites and Apatite-like Compounds. Kyiv: Naukova Dumka.-2010.-P. 483 (In Russian).
2. *Dorozhkin S.V.* Nanodimensional and nanocrystalline apatites and other calcium orthophosphates in biomedical engineering, biology and medicine // Materials.-2009.-2, N 4.-P. 1975-2045.