



Contribution ID: 332

Type: Poster

Technology of obtaining of fine powders of silicon-substituted hydroxyapatite

Tuesday 3 October 2017 16:30 (1h 50m)

A new technology of obtaining bioactive and bioresorbable ceramics was developed. Investigations of the influence of the initial components, the order of mixing of solutions, pH, synthesis temperature and the heat treatment of precipitates isolated from solutions by the method of co-precipitation are carried out. Optimum conditions are revealed and the technologies of obtaining of single-phase of fine powders of silicon-substituted hydroxyapatite Si-HA powders ($1.4 \div 4.3$ wt.% Si) are developed. The use of sodium silicate solution (method-I) as a source of silicon makes it possible to obtain materials with a particle size of $100 \div 200$ nm. The use of tetraethoxysilane leads to a decrease in the dispersion to $40 \div 100$ nm, which is an advantage of method-II. The uniform distribution of the elements (P, Ca, Si, O) over the surface, observed on the microphotographs made in the X-ray emission, and the absence of segregations confirm the single-phase Si-HA of the products obtained at $t=900^{\circ}\text{C}$, regardless of the deposition method. Chemical, X-ray phase analysis and IR-spectroscopy of samples calcined at 900°C indicate the formation of single-phase crystalline products with apatite structure that correspond to the formula $\text{Ca}_{10}(\text{PO}_4)_6-x(\text{SiO}_4)_x$, where $x = 0.5; 1.0$ and 1.5 ($1.4 \div 4.3\%$ by weight of Si). The powders obtained are thermally stable in the temperature range $400 \div 1000^{\circ}\text{C}$. An increase in the silicon content in the composition of Si-HA to 4.3 wt. % Si reduces its stability to $t = 1000^{\circ}\text{C}$.

Summary

A method was developed for the synthesis of individual calcium hydroxyapatite, which, unlike known methods, allows the synthesis of large batches of the desired product without reducing its bioactivity. The material, synthesized according to this technique, of different degrees of dispersion, calcined at different temperatures, was tested at the Donetsk National Medical University in the composition of dental compositions for the correction of tooth color, treatment of alveolitis, chronic periodontitis, acute deep caries. It was found that modified hydroxyapatite in the form of a powder or granules can be used in orthopedics and bone-jaw surgery with greater effect than individual hydroxyapatite. That is why it is necessary to continue work towards the development of new compositions and materials based on modified hydroxyapatite calcium. The commercialization of research results is also expedient in view of the high quality of the product received and its cheapness.

Author: Ms MEDVED, Anna (Donetsk National University)

Co-authors: Mrs POIMANOVA, Elena (Donetsk National University); Dr ZASLAVSKA, Ludmila (Donetsk National University)

Presenter: Ms MEDVED, Anna (Donetsk National University)

Session Classification: Poster session