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RESULTS OF THEORETICAL CALCULATION OF THE POSSIBILITY AND CONDITIONS OF FORMATION OF A MIXTURE OF CALCIUM PHOSPHATES*

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Calcium phosphates are chemical compounds of interest in many interdisciplinary fields of science, including geology, chemistry, biology and medicine. According to the literature, the first attempts to establish their chemical composition were made by Berzelius in the mid-19th century. About 70 years later, the existence of different crystalline phases of calcium phosphates was hypothesized.

Biocompatible materials (biomaterials and biomimetic materials) are materials that do not cause a negative response from a living organism when in contact with it. Such materials are widely used for practical purposes: as bone cements, in joint replacement, skin restoration, in targeted drug delivery systems, in dental implants, contact lenses, etc.

Based on data on the thermodynamic values of solubility products, the functional dependences $pC(Ca^{2+}) = f(pH, pC(PO_4^{3-}))$ were determined and three-dimensional diagrams (Figure 1) ("stability fields") were constructed for compounds whose formation is likely in given conditions. conditions according to the calculations made. The range of anion concentrations was selected based on literature data on the concentration of phosphate ions in various physiological fluids. The region located above the plane describes the conditions under which the formation of a phase is thermodynamically impossible, which makes it possible to judge the stability of the system under certain conditions.

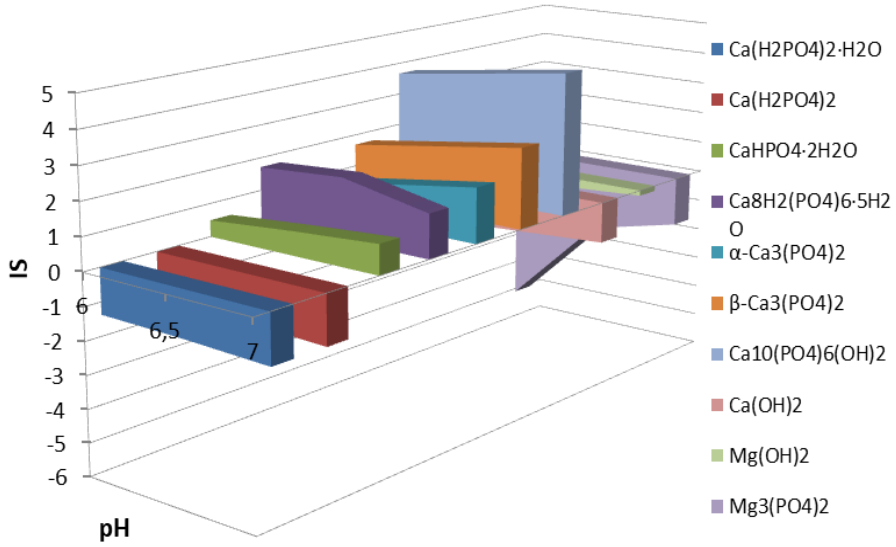

Fig.1. Graphical dependence of IS of poorly soluble compounds on pH.

A theoretical calculation was made of the possibility and conditions for the formation of mineral phases at concentrations of sediment-forming ions Ca^{2+} and PO_4^{3-} 50.0 mM and 37.5 mM, the addition of Mg^{2+} ions 12.5 mM, and pH = 6.5. It has been established that under these conditions the formation of a mixture of calcium phosphates is possible, with HA being the most stable phase. Based on the calculated data, a synthesis was carried out, as a result of which it was established that the resulting sediments were represented by the phases of HA, OCP and brushite.

Methods have been proposed for producing composite materials based on a mixture of FA and polysaccharides (sodium alginate, chitosan, hyaluronic acid and their complexes), the properties of which can be adjusted by varying the filler/matrix ratio and drying temperature.

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