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リン酸第 8 カルシウムのモルフォロジー形成時における中間生成物の役割
The morphological relationship of octacalcium phosphate and its precursor: the role of intermediate phase

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Octacalcium phosphate (OCP) is the precursor of hydroxyapatite (HAP) which is main component of human tissue. HAP crystals which form through OCP are pseudomorph of OCP. Thus, the investigation of OCP morphological decision is connected with the later phase, HAP morphological decision. In around neutral pH solution, amorphous calcium phosphate (ACP) is precipitated as an initial solid phase at supersaturated calcium phosphate solution. Wherein, we investigated the formation process of characteristic morphology of OCP from ACP in solution.

We prepared 1 mol/L CaCl2 and 0.5 mol/L KH2PO4 solutions which were also buffered by tris amino methane, and 0.15 mol/L tris amino methane-HCl buffer solution. These three solutions were gently blended without starring to observe the morphological connection between initial phase and later phase through the materials evolution of calcium phosphates precipitations in solution by field emission scanning electron microscopy (FE-SEM), transmission electron microscopy (TEM) and X-ray diffraction (XRD). (The total concentration is Ca = 0.075 mol/L, PO4 = 0.045 mol/L, tris amino methane = 0.015 mol/L, 32 °C, initial pH = 7.7) Immediately after blending, white indeterminate precipitates were emerged and formed gel-like structure which was maintained for 40 minutes after blending. The solution pH was gradually decreasing around 4 until 40 minutes later. In FE-SEM and TEM observation, the gel-like structure was consisted of sphere-like ACP particles with 100 nm in diameter and ACP spherulites with 3-20 micro meter in diameter. In proceeding time, fiber-like beta-tri calcium phosphate crystals (TCP) were emerged in gel-like structure and ACP sphere particles were vanished. 3 minutes later, ACP spherulites transformed through TCP like phase. 6-12 minute later, the TCP like phase spherulites transformed spherulites which composed of both of single OCP crystal and TCP polycrystals. TEM dark field image showed OCP and TCP domains were mingled. Finally, the spherulites transformed into single OCP crystals with maintain their whole spheritic morphology until 40 minutes later. These observations suggested that OCP is pseudomorph of ACP. In below 7 pH solution, it suggested that through TCP like phase, morphology of OCP crystals was maintaining initial phase morphology, ACP.

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