results of inelastic neutron scattering suggested that the density of states for vibrational modes is a dominant factor for the relative thermodynamic stabilities of the two polytypes. The density state in low-frequency region is higher in the double-layer polytype, which gives rise to the stability of the double-layered polytype due to the entropic term.

Keywords: polytype, crystal growth, thermodynamic stability

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Effect of biopolymers on hydroxyapatite growth kinetics

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The molecular control of inorganic crystallization by organic substances is a key technology for the fabrication of novel materials that has recently received a considerable amount of attention. This process mimics biological mineralization in which a preorganized organic phase controls mineralization processes. This control is assumed to be mediated by specific interactions between certain crystal planes and biological macromolecules that are most conveniently referred to as acidic macromolecules. Microstructural control is exerted on all levels, from the molecular and nanometer scale to the overall three dimensional structure (1, 2). In this work, the effect of a biodegradable, environmentally friendly polysaccharide-based polycarboxylate, biopolymers, on the crystal growth kinetics of hydroxyapatite was studied. We present a facile way to produce HAP nanoparticles by wet chemical synthesis under controlled temperature, pH, and atmospheric conditions. Throughout the course of the seeded growth experiments, the pH of the working solution and the added volume of titrants as a function of time were recorded and stored in the computer for further analysis. The experimental results show that the retardation in mass transport in growth process is controlled by the carboxylation degree of the biopolymer and its concentration.

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Keywords: hydroxyapatite, biopolymers, crystallization

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Crystal morphology and surface microtopograph of disodium inosine 5'-monophosphate octahydrate

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Information on growth mechanisms of crystals is inevitable to understand and control crystal structures, size, and quality. Interactions in nucleotide crystals consist of hydrogen bonds, van der Waals interactions and ionic bonds. Therefore nucleotide crystals situate at intersection of inorganic crystals, molecular crystals and crystals of macromolecules. As the first sample of nucleotides, crystal growth of disodium inosine 5'-monophosphate (Na_2IMP) octahydrate was investigated. Na_2IMP crystallizes from an aqueous solution. Under high supersaturation, rod-shaped crystals elongated along the *a* axis were obtained. Plate form with well developed {0 0 1} appeared under low supersaturation. Crystals with well developed {0 1 0} appeared occasionally. The crystals were twinned frequently. *In-situ* observation of the crystal surfaces was carried out using a differential interference microscope and a phase contrast microscope. Under high supersaturation, spiral growth and 2D islands were observed on {0 0 1} and/or {0 1 0}. The morphology and surface microtopograph will be discussed based on the crystal structure.

Figure 1. Spiral growth on {0 1 0} surface.

Keywords: crystal growth, surface microtopograph, nucleotide

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Optimization of a salt concentration in a PEG-based crystallization solution by a Gel-Tube method

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Recently, polymer such as polyethylene glycol (PEG) is the most frequently used reagent in a protein crystallization solution. However, the optimization of a salt concentration as an additive has not been discussed so often. We have focused on an optimum salt concentration in the crystallization solution in which PEG was used as a precipitant. To know the optimum concentration of the salt in a certain PEG reagent, the counter-diffusion method[1,2] is useful because the salt diffuses into a capillary much faster to reach the maximum concentration than a PEG of high molecular weight such as PEG 4000. We crystallized alpha-amylase and lysozyme in a 30% PEG 4000 solution with various concentration of NaCl. We obtained alpha-amylase and lysozyme crystals in the concentration range between 0.2 and 0.3 M and between 0.3 and 0.7 M, respectively. These results suggested that there was an optimum range of the salt concentration for the crystallization if the concentration of the PEG was fixed. It was consistent with the results predicted previously[3]. In another word, an unsuccessful PEG-based crystallization condition can be changed to a successful one if the salt concentration is changed.

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