Formation of Large Sized Aragonite Crystals by Using Gel Method

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Aragonite is known to give plastics stronger mechanical property and heat resisting property than calcite when it is used for fillers. If aragonite crystals larger than 1.0 mm are available, we can expect more high-performance productions. Calcite is more stable than aragonite under ambient pressure. But, when crystallization rate is high, in other words at high temperature or high solute concentration, aragonite is formed. However, when CaCO3 is formed from high concentration of Na2CO3 and CaCl2 solution, stable amorphous intermediate is formed and calcite is easily formed from it. The purpose of this research was to find out the method and conditions to form large sized aragonite crystals at a normal pressure. Gel method was adopted to maintain solute concentration in narrow range. At first aragonite formation conditions were investigated. The most suitable conditions obtained were as follows: temperature: 70 °C, Na2SiO3 concentration: 0.10 mol/L, gel pH: slightly acidic, and CaCl2 concentration: 0.10 mol/L. Next, 4.0 mm of aragonite crystals were successfully obtained by increasing the volume of CaCl2 solution and left as it was for long days. Gel was kept slightly acidic during the crystallization. In addition, the volume of CO2 generated from gel was measured. Using CO32- concentration thus obtained in the gel, the concentration of Ca2+ for reaching solubility product of CaCO3 was calculated. The initial Ca2+ concentration suitable to form aragonite nucleus was obtained. Many large sized aragonite crystals were steadily formed by adding Ca2+ to gel before penetration of CaCl2 solution into the gel.

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