

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 CaCO_3 is formed from high concentration of Na_2CO_3 and CaCl_2 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, Na_2SiO_3 concentration: 0.10 mol/L, gel pH: slightly acidic, and CaCl_2 concentration: 0.10 mol/L. Next, 4.0 mm of aragonite crystals were successfully obtained by increasing the volume of CaCl_2 solution and left as it was for long days. Gel was kept slightly acidic during the crystallization. In addition, the volume of CO_2 generated from gel was measured. Using CO_3^{2-} concentration thus obtained in the gel, the concentration of Ca^{2+} for reaching solubility product of CaCO_3 was calculated. The initial Ca^{2+} concentration suitable to form aragonite nucleus was obtained. Many large sized aragonite crystals were steadily formed by adding Ca^{2+} to gel before penetration of CaCl_2 solution into the gel.

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