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Abstract

Calcium carbonate was crystallized in alkaline silica gel with the presence of glycine. The crystallization proceeded with a counterdiffusion method by the reaction of calcium chloride and sodium carbonate. Optical microscopy observation showed a significant effect of glycine on the morphology control of calcite crystals. When the initial concentration of glycine was high enough (10 mg/mL, 20 mg/mL), spherical vaterite particles formed in alkaline silica gel concomitantly together with dumbbell shaped calcite particles. The *in situ* study by micro-Raman spectroscopy demonstrated that both vaterite and the concomitant calcite were stable phases during their growth processes since the initial appearance. A possible mechanism has been discussed to emphasize the effect of glycine on the nucleation of vaterite and the morphological control of calcite.

Key words: A1. Crystal morphology, A1. Diffusion, B1. Calcium carbonate, B1. Silica gel.

Introduction

Silica-carbonate biomorphs are purely inorganic, mesocrystalline materials exhibiting complex micro-architectures and non-crystallographic “life-like” morphologies such as helical filaments and sinuous laminar sheets [1-4]. These materials are composed of well-organized carbonate nanocrystals through a self-assembled process in alkaline silica-rich media (aqueous solution or hydrogel) [5-9]. Under this alkaline silica-rich condition, the self-assemble process of silica-carbonate biomorphs is driven by simple inorganic chemical interactions without the presence of any organic compound. In this process, silica takes over the structure directing role usually performed by organic compound in the vast majority of the studies on biomineralization and biomimetic crystallization. Therefore, this purely inorganic system is considered as an important laboratory model for developing straightforward bottom-up strategies towards the design of functional materials [10-13]. Moreover, the revelation in recent studies on biomineralization that the mineral formation of calcium carbonate could also occur in hydrated gel-like medium [14, 15], has aroused a great deal of *in vitro* study of biomineralization of calcium carbonate in