

Silica-Witherite Biomorphs

Self Assembly of Inorganic Material

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Introduction

The precipitation of barium carbonate (witherite) in silica-rich media at elevated pH results in the formation of complex curvilinear crystal aggregates such as periodically twisted filaments, worm-like braids and flat sheets¹ (Fig. B, D, E). Such unique ultrastructures can be grown simply by mixing soluble barium salts (BaCl_2) with alkaline silica sols and allowing atmospheric CO_2 to diffuse into the system. These so-called silica biomorphs closely mimic the appearance of certain living forms despite their inorganic origin (Fig. C). A closer inspection of their microstructure reveals a textured core comprising myriad

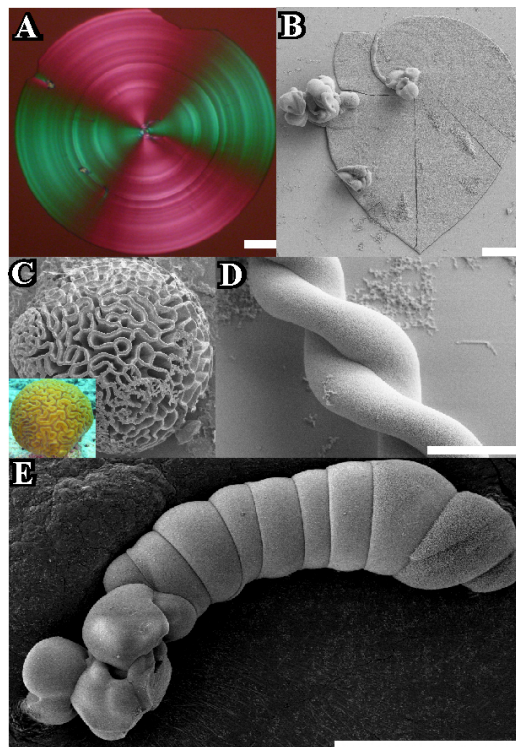


Figure 1: Morphologies, typical for silica-witherite biomorphs (B, D, E). (A) Optical micrograph of a leaf-like structure between crossed polarizers. (C) A coral like biomorph in comparison to its living counterpart. Scale bars are 50 μm (A, B, E) and 20 μm (D).

witherite nanocrystals of uniform size and shape, sheathed by a skin of amorphous silica. Individual rod-like crystallites are arranged in a quasi-parallel manner, though maintaining a slight, coherent misalignment.⁴ These circumstances lead to an orientational ordering throughout the whole aggregate, which becomes manifest in polarized optical micrographs as characteristic Maltese cross extinction patterns (Fig. A).

Projects

- Influence of a high (or low) Ba²⁺ concentration on the characteristics of biomorphs .
- Determination of number and size of biomorphs as a function of time.

Additional Information

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