

Aragonite Precipitation: Exploring the Influence of Biomolecules

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Aragonite precipitation underpins the building of coral reef structures. A greater understanding of biomineralisation is vital to predict the impact of changing dissolved inorganic carbon (DIC) chemistry on calcifying organisms and reef development. We have developed a method to precipitate synthetic aragonites under tightly controlled pH, [Ca], DIC and temperature conditions. The experiments are conducted under a low pCO₂ stream to avoid CO₂ outgas or invasion between the precipitating fluid and overlying atmosphere. We precipitated aragonite under conditions analogous to those of the coral calcification fluid (pH_{seas} = 8.5-9.5, DIC 4000-6000 $\mu\text{mol kg}^{-1}$) and in the presence of amino acids commonly identified in the coral skeletal organic matrix. All experiments were conducted at T = 25±0.2°C (1 σ), salinity = 35 and using an aragonite seed.

Aspartic acid inhibited aragonite precipitation by 79% at pH 8.71±0.02 and by 47% at pH 8.86±0.03. Glutamic acid also inhibited aragonite precipitation but to a lesser degree than aspartic acid (by 20% at pH 8.71±0.02 and by 4% at pH 8.86±0.03). Glycine had a small, but potentially positive effect, on precipitation rate. Our method provides an opportunity to explore the effects of biomolecules and DIC on aragonite precipitation rate and crystal morphology. This is relevant to corals and other calcifying organisms.