

Crystallisation of CaCO₃ from multicomponent solutions

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Understanding the complexity of calcium carbonate (CaCO₃) crystallisation in seawater is pivotal to our knowledge of biomineralization processes. While previous studies have examined the effect of common seawater ions such as Mg²⁺, Sr²⁺, SO₄²⁻ on CaCO₃ formation, these have been limited to one or two maximum ions simultaneously [1]. Our research focuses on the kinetics and polymorph selection of CaCO₃ in solutions containing Mg²⁺, SO₄²⁻, Na⁺, and Cl⁻ simultaneously. We have followed the crystallisation reactions and used powder X-ray diffraction (XRD) and scanning electron microscopy (SEM) to determine polymorph selection and to characterise the morphology of the samples at environmentally relevant conditions. The results indicate that Mg²⁺ and SO₄²⁻ tend to promote aragonite over calcite and vaterite formation. These ions strongly influence aragonite crystallisation rate and the morphology and stability of the primary polymorph formed from solution. By examining CaCO₃ formation in a multicomponent solution this provides a better understanding of the controls of the biomineralization, for example, of foraminifera in seawater.

[1] Nielsen, M. R. *et al.* (2016) Inhibition of Calcite Growth: Combined Effects of Mg²⁺ and SO₄²⁻, *Crystal Growth & Design*, **16**, 6199–6207.