Sr Incorporation into aragonite: Effects of temperature, supersaturation and organics

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Aragonite occurs via biological or physico-chemical processes through precipitation in many different environments including marine ecosystems. It is known that the formation and growth of aragonite are dependant on several parameters such as temperature, concentrations of chemical species and organics. Strontium (Sr) is often used as an indicator of climate change because it is one of the ocean conservative elements. In this study, we investigated Sr incorporation into aragonite over a wide range of temperature and supersaturation in the presence and absence of organics.

All samples were synthesized through a constant-addition method with varying temperatures, injection rates, and concentrations of species. XRD shows that all synthesized samples even with Sr are pure aragonites. Although the crystal size and growth rate for Sr-incorporated aragonite increase, there is no distinctive difference in crystallinity of the synthesized aragonite even with increasing temperature and supersatuation with respect to aragonite. Note that partition coefficient of Sr into aragonite decreases from 2.37 to 1.57 with increasing degree of the supersaturation. It is also found that the partition coefficient of Sr decreases from 1.90 to 1.54 at 15 °C and 40 °C, respectively. However, the partition coefficients of Sr in the presence of various organics are 1.59 to 1.52, showing not much difference. We, therefore, note that temperature and supersaturation climbing with respect to aragonite increase growth rate of aragonite crystals and decrease Sr incorporation into the structure of aragonite. Our results suggest that the partition coefficient of Sr to biogenic aragonite could be seriously affected by temperature and degree of supersaturation in solution.