New insights from precipitation experiments of aragonite-strontianite solid solutions at ambient temperature

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The Sr content of naturally occurring aragonites, e.g. in corals, is a well-established proxy for reconstructing paleo seawater surface temperatures. Indeed, the incorporation of Sr into aragonite is characterized by a partitioning coefficient (D_{Sr}) of about 1 owing to the isostructural framework of aragonite and strontianite. Despite the fact that aragonite and strontianite form a complete solid solution, to date only a few experimental studies exist, where (i) the incorporation of Sr into aragonite as a trace element and (ii) subsequently the formation of the complete aragonite-strontianite solid solution at ambient temperatures have been investigated systematically.

Here, we present a range of precipitation experiments encompassing the complete $Ca_xSr_{(1-x)}CO_3$ solid solution performed at 25ºC and 1 atm CO_2 using a mixed flow reactor modified after [1].

The obtained results indicate the formation of a complete solid solution, as evidenced by the continuous peak shift over the compositional range of the solids derived from single phase XRD-patterns. The precipitated CaxSr(1-x)CO3 minerals give insight into the formation mechanisms of double carbonates (strontianite-aragonite) from aqueous solutions and on the systematics of Sr uptake in natural aragonites. Thus they will help clarify, whether vital effects are modifying the elemental partitioning behaviour of biogenic aragonites.

In order to elucidate the extent of reached equilibrium between the aqueous phase and the precipitated solids, data on distribution coefficients and solubility products for the entire series of $Ca_xSr_{(1-x)}CO_3$ minerals are provided. Further work on stable isotopes (O, Ca, Sr) is going to verify possible equilibrium isotope fractionation.

[1] Mavromatis et al. (2013) *Geochim. Cosmochim. Acta*, **114**, 188-203.