

# Calcium and strontium isotope fractionation during inorganic precipitation of calcium carbonate

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We performed  $\text{CaCO}_3$  precipitation experiments following the setup of Lemarchand *et al.* (2004) at 12.5°C, 25°C and 37.5°C. Supersaturation was controlled by the decomposition rate of  $(\text{NH}_4)_2\text{CO}_3$  and the diffusion rate across a membrane and precipitation of either calcite or aragonite by varying the Mg-concentrations in the solution. Samples were measured for Sr/Ca ratios,  $\Delta^{44/40}\text{Ca}$ - and  $\Delta^{88/86}\text{Sr}$ -isotope ratios. We confirm that for calcite and aragonite the  $\Delta^{44/40}\text{Ca}$  values become more positive as a function of rate for 12.5 and 25°C but become more negative for 37.5°C. The two lower temperatures confirm earlier observations whereas the higher temperature agrees well with the Tang *et al.* (2008) measurements. In contrast,  $\Delta^{88/86}\text{Sr}$  values become more negative as a function of rate independent of temperature. At constant rate for both calcite and aragonite as well as for Sr and Ca isotopes their fractionation factors tend to be larger as temperatures decreases. We speculate that the Ca isotope fractionation as a function of rate depend on the complexation with either  $\text{H}_2\text{O}$  or  $\text{NH}_3$  switching between kinetic and equilibrium isotope fractionation. In contrast Sr isotope fractionation is controlled by kinetic processes only.