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The temperature dependent strontium isotope fractionation ($\delta^{88/86}$Sr) during calcium carbonate precipitation

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In order to study the influence of stable isotope fractionation during inorganic and biologically controlled $CaCO_3$ precipitation we´ve developed the analytical principles for the measurement of Strontium (Sr) isotope fractionation. We´ve established a measurement protocol for the application on a MC-ICP-MS (*AXIOM)* using the common bracketing standard technique. The Sr CRM NBS987 was used as reference material for all measurements and to calculate the Sr fractionation. Latter value is expressed by the δ-notation defined as:

$\delta^{88/86}$Sr = [(^{88}Sr/^{86}Sr)$_{sample}$ / (^{88}Sr/^{86}Sr)$_{standard}$] * 1000 –1.

A first set of experiments focused on the temperature dependency of Sr-isotope fractionation. For this purpose we´ve studied inorganically precipitated aragonite and calcite prepared under controlled conditions in a temperature range from 10 to 50 ˚C. In addition, cultured and naturally grown corals were analyzed for their $\delta^{88/86}$Sr values.

Repeated measurements of IAPSO seawater standard showed a mean $\delta^{88/86}$Sr value of 0.383 $\pm$ 0.008 (2SEM) being the isotopically heaviest material measured so far. The first results of the inorganically precipitated aragonite and the natural corals revealed a clear temperature dependency of the $\delta^{88/86}$Sr values. For inorganic aragonite the slope of this correlation is about 0.0055 $permille^{\circ}$C. However, for naturally grown corals a 6 fold steeper slope of 0.033 $permille^{\circ}$C was determined. This difference between inorganic and organic aragonite is still under debate and will be studied by further laboratory experiments.