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# Strontium and Calcium Isotope Fractionation during Aragonite Formation - Corals versus Inorganic Precipitation

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Scleractinians (stony corals) are used in geochemical applications as proxy recorders. Their aragonitic skeleton records changes of ambient marine conditions by distribution of trace elements and stable isotope. Such signals can provide datable information on past climate and marine environment during $CaCO_3$ formation. Nevertheless, biological controlled coral skeleton growth is complex and is considered to occur in chemical and isotopic disequilibrium. In order to better constrain bio-calcification in corals we have studied precipitation patterns in *Acropora sp.* and the effect of environmental conditions on the distribution of trace elements and stable isotopes of Strontium and Calcium in inorganic aragonite.

We precipitated inorganic aragonite from natural seawater at distinct temperatures (15˚C, 25˚C, 30˚C) and precipitation rates ($10^{1.8}$-$10^{3.7}$ $\mu$mol·h$^{-1}$·m$^{-2}$) using the $CO_2$ diffusion technique (Tang et al., 2008). Our results indicate that aragonite that was precipitated from natural seawater has a $\Delta^{88/86}$Sr of -0.18‰ similar to aragonite precipitated from artificial seawater solutions (-0.19‰). The same $\Delta^{88/86}$Sr range is found in coral aragonite (-0.17 to -0.23‰). Interestingly, we found no significant rate or temperature effect on strontium isotope fractionation during inorganic aragonite precipitation.

We cultured *Acropora* corals at temperatures of 19˚C, 22˚C, 25˚C and 28˚C and pH of 7.9, 8.0, 8.2 and 8.3. The *Acropora* colonies were exposed to lower Sr/Ca ratio in the pre-experimental conditions to distinguish between old and newly grown material. We found irregular and spatially inhomogeneous growth pattern by strontium mapping using electron microprobe. We also observed differences in the distribution of the newly grown skeleton between specimens at different experimental conditions. Preliminary results show that $^{44/40}$Ca fractionation in the specimens is higher compared to inorganic aragonite. This is in contrast to $^{88/86}$Sr fractionation, where no difference between corals and inorganic aragonite was obtained. Our observations may be important for understanding the growth pattern of scleractinian of different genera, and their use as a proxy archive.

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Tang, J., Köhler, S. J., & Dietzel, M. (2008). $Sr^{2+}/Ca^{2+}$ and $^{44}Ca/^{40}Ca$ fractionation during inorganic calcite formation: I. Sr incorporation. *Geochimica et Cosmochimica Acta*, 72.