

Elemental and isotopic composition of cultured scleractinian corals

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Scleractinian corals are known for strong vital effects with respect to stable isotope and trace element incorporation. Nevertheless, they have successfully been used as proxy recorders for a variety of environmental parameters, including pH and temperature. Understanding the processes inducing 'vital effects' is essential for a successful application of these proxies.

To investigate the effects of pH and temperature, a branching scleractinian coral of the genus *Pocillopora* was grown under controlled laboratory conditions in natural seawater at (i) a temperature range from 22 to 28°C at constant pH; and (ii) a pH range from 7.8 to 8.3 at constant temperature. Samples were analyzed for boron, oxygen, carbon, and calcium isotopes, as well as Sr/Ca and Mg/Ca ratios.

Covariation of coral Mg/Ca and Sr/Ca with ambient carbonate ion concentration and temperature was recently explained by Cohen *et al.* [1] and Gaetani *et al.* [2] with a Rayleigh distillation model where the efficiency of cation utilization in a calcifying fluid increases with CaCO₃ saturation and temperature. This model implicitly predicts a significant positive correlation of the skeletal calcium isotopic composition with seawater pH and temperature.

The Rayleigh model can quantitatively explain the relatively high Ca isotope ratio observed in coral aragonite. However, no significant change in Ca isotope ratios was observed, neither with temperature nor pH. While Mg/Ca ratios increase with temperature as expected with the Rayleigh model, they show only 10% of the predicted Mg/Ca variations for the investigated pH range. Furthermore Sr/Ca showed no change with pH whereas Sr/Ca vs. temperature displayed a steeper slope than expected for inorganic aragonite precipitation [3]. Consequently, our data suggest that simple application of the Rayleigh model cannot explain the proxies incorporated to our cultured corals.

[1] Cohen *et al.* (2009) *G3* **10**, 1-12. [2] Gaetani *et al.* (2011) *GCA* **75**, 1920-1932. [3] Dietzel *et al.* 2004 *Chem. Geol.* **203**, 139-151.

Characteristics of arsenic distribution in the Holocene sediment deposits of South-Western Bangladesh

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The geochemistry of aquifer sediments coupled with the groundwaters of Kalaroa, south-western Bangladesh was studied with the object of elucidating As distribution to investigate its sorption and mobility. The role of the channel slope and sediment diameter on the sediment depositional process has been revealed evidently by the observations obtained from the borehole lithology. Results showed that trapped As on sediment matrix could be a function of the sediment diameter, its surface area and relative radio-carbon age. These observations were corroborated significantly with the findings obtained from laboratory leaching and adsorption tests. It was found that the brown clay which has the smallest particle diameter could adsorb as much as 98% of As from the contaminated groundwater (500 µg/L) while relatively lower As (74%) was captured by the medium grained particles having relatively larger diameters and smaller areas. Based on the adsorption capability, the sediment types may be ranked such as; brown clay > black clay > very fine sand > fine sand > medium sand. Presence of As was also observed to be greatly dependent on the availability of its (As) carrier minerals particularly Fe and Al oxides along the aquifer depth. The two younger sediment types such as brown clay and very fine sand were observed as the main sources in releasing the As into the groundwater, as they have contained organic carbon that may be sufficient enough to get decomposed under the microbial activities. The positive correlations that were obtained for As with Fe, Al, HCO₃, and DOC from the groundwater analysis strongly support such As release mechanism.