



Stable isotope data of modern and ancient microbialites

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Carbonate-based reconstructions of environmental conditions in the Precambrian rely heavily on shallow-water and typically microbially-mediated carbonates. This is because Precambrian carbonate rocks formed either microbially or abiotically. Consequently, organo-sedimentary carbonate structures (microbialites) are extensively used as archives of physico-chemical conditions of early Earth environments using traditional isotopes such as stable carbon and oxygen isotopes. When post-depositional alteration is carefully evaluated, valuable information on local seawater chemistry may be gained. More recently, non-traditional isotope systems are applied to microbialites for reconstructing, for example, the redox evolution of our planet. However, interpretations of non-traditional isotope data are challenging, and information on diagenetic alteration is crucial. We present geochemical analyses of modern and ancient microbialites, which are part of an ongoing study on the chromium isotope systematics in modern and fossil microbialites (1). Here, we focus on stable C- and O-isotope data and diagenetic alteration of the analysed microbialites. This approach aims to build a framework for interpreting paleo-environmental reconstructions using non-traditional isotope systems. First results of powdered sub-samples of the modern microbialites show that stable C- and O-isotope data reliably reflect the environmental conditions of their depositional setting: high $\delta^{13}\text{C}$ values (+2 to +8 ‰) indicate extensive microbial activity and high $\delta^{18}\text{O}$ values point to evaporative settings. One set of Precambrian microbialite samples also has high $\delta^{13}\text{C}$ values (~+4 ‰), similar to the modern microbialites, but in comparison to modern samples, relatively low $\delta^{18}\text{O}$ values (~-3 ‰). Yet, another set of Precambrian microbialite samples display both low $\delta^{13}\text{C}$ (~-0.5 ‰) and $\delta^{18}\text{O}$ values (-3 to -6 ‰). The results are interpreted to indicate a different depositional environment and/or more likely, a stronger degree of post-depositional diagenetic alteration that might also explain the comparatively low $\delta^{53}\text{Cr}$ values of these samples.