



How do foraminifera discriminate against magnesium and how does this affect their calcite chemistry?

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Incorporation of magnesium (Mg) in the calcite of most species of foraminifera is foremost determined by active selection against Mg during the production of an internal calcium-pool. This internal pool has a Mg/Ca that is approximately 100 times lower compared to the seawater surrounding the foraminifer. Seawater temperature subsequently influences the amount of Mg incorporated, which is the reason that foraminiferal Mg/Ca can be used to reconstruct paleo-seawater temperatures. The initial discrimination step against seawater Mg implies that changes in seawater Mg/Ca potentially bias such reconstructions in a non-linear way. This needs to be accounted for when reconstructing temperature on timescales where seawater Mg/Ca varies (i.e. >1 Ma). To understand the effects of seawater Mg/Ca on calcification in foraminifera, we cultured the benthic species *A. tepida* at a range of seawater $[Mg^{2+}]$ and $[Ca^{2+}]$. Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry (LA-ICP-MS) was used to determine Mg incorporation in the calcitic tests. In addition, calcification rates were determined to calculate internal flux of ions that are used for biomineralization. Results are combined with a suite of recently conducted physiological and culturing experiments to derive a mechanistic bio-calcification model that allows understanding trace element partitioning in foraminifera.