Magnesium isotope composition of recent sabkha pore fluids and stoichiometric dolomites (UAE)

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Sabkha type dolomites are common deposits of the Early Earth. Potentially, these carbonates may act as archives of Precambrian seawater magnesium isotope ($\delta^{26}Mg$) ratios. In order to explore $\Delta^{26}Mg_{dol\text{-}Mg(porewater)}$, we make use of actualistic sabkha type dolomite precipitation in the Gulf region as a potential analogue for the ancient deposits. We document and discuss the first detailed sabkha $\delta^{26}Mg$ data set of Mg-bearing solids including stoichiometric dolomites (degree of ordering > 0.9; mean $\delta^{26}Mg_{dol}$ = -0.79‰±0.41 2σ, n=17) and related marine pore waters. Sabkha shallow ground water collected in trenches displays $\delta^{26}Mg$ values of about -0.59‰, i.e. is only moderately enriched in ^{26}Mg relative to the present-day seawater signature of -0.83‰. Conversely, the $\delta^{26}Mg$ of evaporated porewater is enriched by +0.43‰ relative to that of $\delta^{26}Mg_{seawater}$. The term "apparent" fractionation for the variable $\Delta^{26}Mg_{dol\text{-}Mg(porewater)}$ (+0.4 and -0.3‰) is used here. Moreover, evaporated sabkha porewater differs, in terms of its isotope signature, from seawater. The data shown here imply that ancient sabkha dolomites cannot be used as direct proxies for coeval $\delta^{26}Mg_{seawater}$. Our present understanding is that the magnesium isotope signature of sabkha dolomites is related to complex kinetics of precursor formation, dissolution/precipitation reactions including microbiological effects and involves variable Mg sources and sinks in a temporally and spatially variable microenvironment.