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Brucite in Oceanic Serpentinite

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Brucite formation is believed to play a key role in modulating the pH and redox conditions during serpentinization. However, recent studies suggested that oceanic serpentinites do not contain significant amounts of brucite[1,2], questioning its importance in serpentinization systems. We applied thermal analysis (TGA-DSC) and Raman spectroscopy to determine the abundance and distribution of brucite in oceanic serpentinite recovered by drilling (n = 48) and dredging (n = 22)[3]. Nearly all (90 %) of the drilled serpentinites contained brucite, constituting up to 15.6 wt. % of the altered rock. The range in brucite contents of completely serpentinized peridotites that were recovered by seafloor drilling can be explained by variations of the initial olivine/orthopyroxene ratio of the peridotite protolith, corroborating the idea that Mg, Fe, and Si are conserved during serpentinization. In contrast, dredged serpentinites were brucite-free which implies that they lost ~4.0 wt. % MgO on average. Estimated fluxes of Mg and alkalinity from dissolution of brucite are relatively small on a global scale. Yet, our data suggest that, on average, brucite stores ~20% of the water in serpentinite uncompromised by weathering, making it one of the most prominent water carriers in slow and ultra-slow spreading oceanic lithosphere. Brucite is common and widespread in unweathered oceanic serpentinite recovered by drilling. This is at odds with the popular notion that oceanic serpentinite is brucite-poor, which likely resulted from a sampling bias toward dredged rocks that had undergone weathering.

References:

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