

Slab fluid redox potential of subducted metasomatized heterogeneous oceanic crust: Insights from Sulfur–Selenium systematics in metarodingites

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Rodingites are formed through hydrothermal alteration of mafic and felsic lithologies induced by reactive fluids from serpentinization of enclosing peridotites in slow MOR, continental passive margins, or subduction zones. During rodingitization, highly reducing fluids promote metasomatic reactions that replace primary assemblage of oceanic crustal rocks with Ca-Al silicates, Ca-Mg silicates, and chlorite. Similar metasomatic reactions between metamafic layers and enclosing ultramafic rocks also contribute to the lithological and compositional heterogeneity of subduction mélanges, which can influence the composition of slab fluids and favor the deep transport of volatiles in subduction zones. Despite their possible contribution to mass exchanges in subduction zones and to the geochemical signature of arc magmas, metamafic rocks formed by Ca-Mg metasomatism are often disregarded in global geochemical balances.

We report a detailed sulfur and selenium systematic in petrologically and geochemically well-characterized rodingites and reaction rims [1] in the Almirez massif (S Spain). The study aims to constrain the redox potential of meta-(ultra) mafic lithologies produced by Ca-Mg metasomatic processes compared to that of altered oceanic crust (AOC) and MORB-derived eclogites. Selenium is a redox-sensitive element that mobilizes when oxidative slab fluids dissolve sulfides. Subsequently, recrystallizing sulfides within the metamorphic assemblage scavenge reduced, isotopically lighter Se. As such, redistributed Se with a large isotopic range traces repeated cycles of sulfide reworking within the subducted crust by episodic, highly oxidized fluid pulses from underlying slab serpentinite [2]. Our preliminary results in Almirez show that metarodingites and associated metamorphic rocks are strongly depleted in Se-S relative to eclogites and MORBs, while reaction rims are commonly enriched in these elements. The Se-S systematic is in contrast to much higher Se-S contents previously reported in MORB-derived eclogites, showing that Ca-Mg metasomatism strongly affects the redox potential of the oceanic crust intermixed with peridotite. We will present Se isotope data to further constrain the redox conditions during dehydration of heterogeneous oceanic crust.

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