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Petrological evolution of subducted rodingite from seafloor metamorphism to dehydration of enclosing antigorite-serpentinite (Cerro del Almirez massif, southern Spain)

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Rodingites are common rocks associated with serpentinites in exhumed terrains that experienced subduction and high pressure metamorphism. However, the response of these rocks to devolatilization and redox reactions in subduction settings is not well constrained. In the Cerro del Almirez ultramafic massif (southern Spain) rodingites constitute about 1-2% of the total volume of exposed rocks. Metarodingites are enclosed in antigorite-serpentinite and chlorite-harzburgite separated by a transitional zone that represents the front of prograde serpentinite-dehydration in a paleo-subduction setting (Padrón-Navarta et al., 2011). Metarodingites occur as boudin lenses, 1 to 20 m in length and 30 cm to 2 m in thickness. During serpentinization of peridotite host rocks, dolerites and basalts precursor of rodingites underwent intense seafloor metasomatism, causing the enrichment in Ca and remobilization of Na and K. Subsequent metamorphism during subduction transformed the original igneous and seafloor metamorphic mineralogy into an assemblage of garnet (Ti-rich hydrogrossular), diopside, chlorite, and epidote. During prograde metamorphism, garnet composition changed towards higher andradite contents. High-pressure transformation of enclosing antigorite-serpentinite to chlorite-harzburgite released fluids which induced breakdown of garnet to epidote in metarodingites. Ti liberation by this latter reaction produced abundant titanite. Released fluids also triggered the formation of amphibole by alkalis addition. Highly recrystallized metarodingites in chlorite-harzburgite present a new generation of idiomorphic garnet with composition equal to 10-30% pyrope, 30-40% grossular and 35-55% almandine + spessartine. This garnet has titanite inclusions in the core and rutile inclusions in the rim. The contact between metarodingites and ultramafic rocks consists of a metasomatic zone (blackwall) with variable thickness (7 to 40 cm) constituted by chlorite, diopside, and titanite. Close to the contact with the blackwall, antigorite-serpentinite is very rich in diopside, olivine and Ti-clinohumite. In this study we present a thermodynamic model of phase relationships in rodingites and transitional blackwalls during their metamorphic history. We mainly aim to establish the evolution of P-T conditions experienced by metarodingites during subduction and the influence of fluids in the formation of mineral assemblages at different metamorphic stages.

REFERENCES

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