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Chromite and uvarovite in rodingite from the lowermost crust of Oman ophiolite: Cr mobility in hydrothermal condition

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Uvarivite-rich garnets have been commonly reported as a secondary mineral from chromitites. We found rodingites that contain uvarovite-rich garnets from layered gabbros, located about 50 m above the gabbro/peridotite boundary (= possible Moho) along Wadi Fizh of the northern Oman ophiolite. The rodingite from Wadi Fizh contains relic cpx gabbro clasts, and is mainly composed of Ca-rich plagioclase (An, 97-100), diopside (Mg#, 0.87-0.97), uvarovite, chromite and titanite. Both chromite and uvarovite are euhedral and fine-grained (<0.1 mm across); they are concentrically zoned and partly skeletal. Unlike the frequent occurrence of uvarovites, which overgrow on chromite documented from chromite-bearing rocks, some uvarovite and chromite occur as discrete grains in the Fizh rodingite. Chromite has a high Cr# (Cr/(Cr + Al) atomic ratio; around 0.8), which is one of the highest Cr# chromian spinels reported from Oman. Fe3+/(Cr + Al + Fe3+) (= YFe) increases from the core (<0.1) to the rim (0.2) in chromite. MnO and TiO2 contents (wt%) of the chromite are 0.5-0.6 and 0.2-0.3, respectively. Cr/(Cr + Al + Fe3+) atomic ratio of uvarovite ranges from 0.5 to 0.6. The YFe of uvarovite is from 0.05 to 0.2.

It is noteworthy that chromite appears authigenic together with other minerals in this rodingite. Chromites or chromian spinels are totally absent in relic cpx gabbro clasts or in neighboring layered gabbros. The euhedral and partly skeletal chromite contains inclusions of pumpellyite. These indicate that Cr was transported with a hydrothermal aqueous solution, which metasomatized the layered gabbro to rodingite. A highly oxidation condition was possible for such high Cr mobility.

Keywords: uvarovite, rodingite, Oman ophiolite, hydrothermal alteration, chrome mobility