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HOW ROBUST ARE PLATINUM GROUP ELEMENTS UNDER HT-HP CONDITIONS? THE NONSBERG-ULTENTAL PERIDOTITES AS NATURAL LABORATORY

Meisel, T.[1], Braga, R.[2] & Morten, L.[2]

[1] General and Analytical Chemistry, University of Leoben, Franz-Josef-Strasse 18, A-8700 Leoben, Austria
[2]Dipartimento di Scienze della Terra e Geologico-Ambientali, Università di Bologna, Italy
e-mail: thomas.meisel@mu-leoben.at

The Nonsberg-Ultental area is part of the upper Austroalpine domain of the Eastern Alps and consists mainly of pre-Alpine high-P migmatitic gneisses. These crustal rocks contain lenses (up to 10 m thick and tens to hundreds meters long) of mantle-derived peridotites, locally crosscut by garnet-pyroxenites. Petrographic and geochemical data for the peridotites reveal a complex tectono-metamorphic history coupled with significant crustal-derived metasomatism.

The peridotites record the unusual transformation from coarse-grained, high-T Spl-peridotites to fine-grained Grt-peridotites. They carry hydrous phases of metasomatic origin, such as amphibole, chlorite and rare phlogopite. The physical conditions of recrystallization of the coarse-grained type have been estimated at 1100-1230°C and 14-21 kbar. These conditions were attained after the intrusion of melts that gave origin to the pyroxenitic layers. The fine-grained garnet-bearing peridotites give equilibration temperatures of 700-800°C at 25-28 kbar. The presence of amphiboles, which are characterized by a strong LILE/HFSE fractionation, has been related to the interaction between the peridotite and H_2O-rich fluids. These metasomatic fluids probably derive from residual fluids left after crystallization of leucosomes during the migmatization of the host gneisses. In this scenario, the Nonsberg-Ultental peridotites may represent former mantle-wedge material that was subducted in Palaeozoic times and cooled due to incorporation in a crustal slab and then metasomatized by crustal-derived fluids.

The high concentrations of platinum group elements (PGE) in peridotites relative to the surrounding crustal material, make the distribution patterns to robust and valuable geochemical tools for the interpretation of the mantle composition and evolution. As Os is one of the PGE its isotopic composition, which is variable due to the radiogenic decay of Re, has contributed significantly to our understanding of the history of the subcontinental mantle. The goal of this work is to understand the influence of metamorphic and metasomatic processes on the PGE distribution and to test how far the Re-Os isotopic system remained a closed system. The petrographically well-studied Nonsberg-Ultental peridotites are thus the ideal field laboratory to test the robustness of the PGE and the Re-Os isotope system. The results will help us to better understand the composition and the evolution of the mantle below the Alps.