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Mantle and melt-percolation phases in peridotitic members of the Variscan Ślęża ophiolite (SW Poland)

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The Gogolów-Jordanów serpentinite massif (SW Poland) is a member of pseudostratigraphic sequence of the Variscan Ślęża Ophiolite. The outcrop of serpentinites is approximetely 22 km long and up 7 km wide. The serpentinites occurring in the central and western parts of the Massif (Radunia, Czernica, Świerczyna and KieŁ czyńskie Hills) contain grains and aggregates of olivine, clinopyroxene and Cr-spinel.

Olivine forms 3 types of grains: low-forsteritic Ni-poor olivine I (Fo_{82}, 0.2 – 0.4 wt. % NiO), olivine II ($Fo_{89.5-93.1}$, NiO = 0.2 – 0.4 wt. %) and olivine III ($Fo_{94.1-95.2}$, NiO = 0.35 – 0.50 wt %. Clinopyroxene (mg# 0.92 – 0.97) occurs in 2 varieties: clinopyroxene I contains up to 0.6 wt. % $Cr_2O_3$and up to 1.1 % wt. % Al_2O_3, whereas clinopyroxene II is richer in Cr_2O_3 (0.8 – 1.4 wt. %) and Al_2O_3 (2.2 – 4.1 wt. %). Clinopyroxene contains small amounts of REE, it is depleted in Gd, Tb, Dy and Ho and slightly enriched in Er, Tm, Yb, Lu relative to chondrite. Clinopyroxene II and olivine II occur as singular grains or as irregular elongated aggregates The spinels are magnetite (Cr ∼0.1 a pfu), ferrichromite (Cr = 2.1 – 2.8 a pfu) and Al-rich chromite (Al_2O_3: 14 - 27 wt. % ,Cr = 0.9 – 1.3 a pfu). The latter occurs as few-grains aggregates and mm thick veinlets and as cores of grains surrounded by magnetite rims.

Olivine III is apparently the relic of MOR mantle peridotites The form of occurrence of olivine II and clinopyroxene II suggest that the minerals could be the remnants of channels used by percolating melt. Their chemical composition is identical to those occurring in the MOR regions which originated due to melt basaltic percolation in the upper mantle peridotites [1]. The same refers to aluminous chromite [2]. Magnetite originated probably during ocean floor metamorphism .

The Gogolów-Jordanów Massif consist of 3 differing parts. The western one contains relics of primary MOR mantle olivine and the central one contains minerals which are the remnants of basaltic magma percolation through MOR mantle. The eastern part of the Massif contains rodingite dikes. The serpentinisation was very intense in the easrtern part and obliterated the pre-serpentine phases.

[1] Seyler M., Lorand J.-P., Dick H.J.B., Drouin M. (2007) Pervasive melt percolation reactions in ultra-depleted refractory harzburgites at the Mid-Atlantic Ridge, 15˚20'N: ODP Hole 1274A. Contrib Mineral Petrol 153: 303-319.

[2] González-Jiménez J.M., Proenza J.A., Gervilla F., Melgarejo J.C., Blanco-Moreno J.A., Ruiz-Sánchez R., Griffin W.L. (2011) High-Cr and high-Al chromitites from the Sagua de Tánamo district, Mayarí-Cristal ophiolitic massif (eastern Cuba): Constraints on their origin from mineralogy and geochemistry of chromian spinel and platinum-group elements. Lithos 125: 101 - 121.