Geophysical Research Abstracts
Vol. 18, EGU2016-6548-2, 2016
EGU General Assembly 2016


# The non-serpentine phases in serpentinites from the Braszowice-Brzeźnica Massif (SW Poland) as traces of magmatic processes within oceanic mantle

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The Braszowice-Brzeźnica Massif - BBM (SW Poland) is a part of the Variscan Central-Sudetic Ophiolite. It is located at the southern termination of the Niemcza Shear Zone and consists of gabbros and serpentinites. The ultramafic rocks occurring in the BBM are (from E to W) serpentinites with abundant relics of olivine and tremolite, lizardite-chrysotile serpentinites and antigorite serpentinites. Clinopyroxene, olivine and zoned chromite grains were found in the central part of the BBM (Mnich Hill) within antigoritic serpentinites.
The non-serpentine phases occur in the following microstructures: (1) olivine-chromite aggregates: olivine (Fo = 90.0-91.0) contains 0.35-0.44 wt.% NiO, elongated or amaeboidal chromite I (Cr# = 0.49-0.50, $TiO_2$ = 0.14-0.15 wt.%) is rimmed by chromite II (Cr# = 0.98, $TiO_2$ = 0.01 wt.%); (2) coarse and dismembered diopside grains (Cpx I, Mg# = 0.91-0.92) containing 0.70-0.80 wt.% $TiO_2$, 3.0-4.0 wt.% $Al2O_3$, 1.0-1.4 $Cr2O_3$ and 0.3-0.5 wt.% Na2O; Cpx I is enriched in REE relative to primitive mantle, the REE pattern reveals HREE enrichment relative to LREE and negative Eu anomaly; (3) olivine-clinopyroxene aggregates: olivine (Fo = 90.4-91.3) contains 0.27-0.35 wt.% NiO, anhedral, often elongated clinopyroxene (Cpx II, Mg# = 0.91-0.92) has <0.1 wt.% $TiO_2$, 3.00-4.00 wt.% $Al2O_3$, 1.00-1.40 $Cr2O_3$ and <0.20 wt.% Na2O, (4) magnetite-bearing olivine grains, locally in aggregates with minute clinopyroxene ones; olivine has variable Fo (86.0-96.0) and NiO concentration (0.02-0.55 wt.%), clinopyroxene (Cpx III, Mg# = 0.93-0.97) contains <0.40 wt.% $Al2O_3$ and <0.20 $Cr2O_3$. Cpx III rims also locally Cpx II.
The non-serpentine phases from the BBM massif have various compositions and mode of occurrence, thus they record various crystallization events. Composition of chromite I is similar to primary chromite grains occurring in oceanic peridotites of the Romanche and Kurchatov F.Z. (Dick and Bullen, 1984), thus the olivine-chromite aggregates represent probably primary mantle phases. Cpx I contains similar amount of the $Al2O_3$, $Cr2O_3$ and Na2O to primary diopsides described from the Marie Celeste FZ and Indomed FZ (Johnson et al., 1990). REE pattern of the Cpx I suggests depletion in mobile trace elements due to melt extraction. Cpx II has $Al2O_3$, $Cr2O_3$ and $TiO_2$ contents similar to those of diopside originated from the melt-percolation reactions, olivine coexisting with Cpx II crystallized probably in the same event. The Cpx III has Al, Cr and Na contents typical for secondary, metamorphic clinopyroxene. Magnetite-bearing olivine is similar to olivine crystallized at expense of serpentine+magnetite precursors, thus is has secondary, metamorphic origin.

This abstract was prepared as a part of the project of the National Science Centre of Poland ("Evolution of serpentinic members of the Lower Silesia ophiolites", DEC-2012/07/N/ST10/03934).

References

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