Analysis of As and Sb in samples from Turtle Pits hydrothermal field using new standard material

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New sulfide standard material was produced for the analysis of As, Sb, Se and Te in sulfides with LA-ICP-MS. The sulfide was synthesized from metal powders and elemental S. Trace metal concentrations are around 30 ppm and were added as chloride solutions. Reaction to sulfide powders proceeded in evacuated silica glass tubes at 973 K, then sintered in a piston–cylinder press for 4 hours at 2 GPa and 1373 K. About one third of the sulfide pellet was analysed with solution quadrupole ICP-MS for bulk trace metal concentrations. A part of the remainder was polished and analysed with an ArF excimer laser coupled to an Element 2 ICP-MS at the Universität Münster. Homogeneity given as 2-sigma relative standard deviation of 20 randomly distributed spot analyses is <7.6% for all trace elements.

The newly obtained standard material was used for the quantitative analysis of a pyrite sample from the Turtle Pits hydrothermal field by LA-ICP-MS. This allows for the spatial resolution of trace element distribution within the sample. Averages of 18 single spot analyses result in As concentrations of 140 – 2000 ppm and Sb contents of 1 – 60 ppm, with no obvious correlation of these two elements. In contrast, within single laser spectra from pyrite a strong correlation between As and Sb has been observed. As arsenic is assumed to be substituted non-stoichiometrically into the pyrite lattice, it seems obvious that in the sample under investigation, Sb is also substituted into the pyrite lattice and that it does not merely occur within inclusions as suggested in previous studies.

Analyses of coexisting sphalerite reveal higher Sb contents of up to 160 ppm, relative to pyrite. The ablation spectra are marked by abrupt elevations in the intensity of Sb which is probably caused by Sb-rich inclusion.

Primary phases in peridotites of the Ślęża ophiolite (SW Poland)

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The peridotitic members of the Variscan Ślęża Ophiolite (SW Poland) are part of the complete ophiolitic sequence. WR trace element and REE patterns of gabbroic/basaltic ophiolite member show MORB affinity [1].

The peridotites are serpentinized but aggregates of olivine ± clinopyroxene ± spinel are preserved in the central part of the outcrop (Radunia Hill). Olivine ($Fo_{91.8-92.6}$) contains 0.2 – 0.4 wt % NiO. Clinopyroxene (mg# 0.92 – 0.94, Cr_2O_3 0.9 – 1.2, Al_2O_3 2.7 – 3.4, Na_2O <0.03 wt. %) is in places altered into clinopyroxene II (mg# 0.95 – 0. 97), chromian magnetite (Cr usually between 0.10 and 0.80 atoms pfu, C=3). Isolated grains of olivine and chromian magnetite occurring in serpentine groundmass are less magnesian ($Fo_{89.3-90.5}$), and rich in Cr, respectively. The whole-rock REE contents are below detection limits of ICP-MS method.

The mineral composition of the aggregates suggests dunitic composition of the protolith. Highly magnesian content of olivine is probably the record of depletion typical for MORB mantle. Clinopyroxene possibly is the result of late melt infiltration. Serpentinization obviously decreases forsterite content in olivine, thus the chemical composition of phases occurring in relics may be not representative for the primary mineral composition.

[1] Pin *et al.* (1988) *Lithos* **21**, 195-209.