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# MAJOR AND TRACE ELEMENT STUDY OF SERPENTINITE AND RODINGITE FROM STOBNA MELANGE (BARDZKIE MTS - SW POLAND)

## INTRODUCTION

The loose blocks of gabbros and serpentinites are known from the poorly exposed outcrops situated in the Stobna stream valley about 12 km south of Ząbkowice Śląskie on the Sudetic Foreland. They belong to Carboniferous sediments of the Zdanów sedimentary sequence outcropped near Marginal Sudetic Fault. In this site, frequent blocks of serpentinites, gabbros, rodingites and sedimentary breccias are most common. They form several tens metres wide zone overlained by graywackes and mudstones with dipping on east at the angle about 40-50$^o$ (Wajsprych 1981). In the terms of sedimentary structures this unit is interpreted as nappe or olisthonappe (Wajsprych 1978).

Several petrographic groups of Stobna exotic "boulders" were recognised after the previous geologic studies. It includes: 1) antigorite serpentinites (after residual peridotites) with mesh structure, 2) augitic diopside-bearing metagabbros (locally mylonitised) and 3) grossularite-diopside rodingites (metasomatically altered primary gabbros) 4) breccias - composed of sharp-edged gabbro and serpentinite fragments embedded in fine-grained clay-bearing detrital matrix. The genetic connection of Stobna basic and ultrabasic rocks with ophiolite nappe, whereby short-distance and gravitational transport was previously postulated (Narębski et al. 1982).

However, other opinions about origin of Stobna serpentinites asumed: 1) emplacement of Braszowice gabbros and serpentinites in the MSF zone (Oberc 1977) or 1) incorporation of these as fragment of an ophiolite nappe transported along the MSF (Jamrozik 1981).

Aim of this article is to present new geochemical data concerning serpentinites and rodingites occurring in the Stobna melange.

## PETROGRAPHY

Two samples of Stobna exotic "boulders" were examined geochemically. One of them represents antigorite serpentinite with relics of forsterite olivine and augite-diopside clinopyroxene. The studied ultrabasite specimen was dark-green in colo-

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ur, aphanitic in structure, locally transected by unoriented narrow pale green serpentine veins up to 1mm in thickness. Under microscope the flame-shaped, interpenetrating structure composed of antigorite (with yellow-greyish serpentine individuals up to several mm in size) is common. Locally, serpentinite exhibit rosette-like or interlocking texture in the sense of nomenclature of serpentine struc-tures after Wicks & Whittaker (1977). The single xenomorphic relics of forsterite (up to 2 mm in size) and larger clinopyroxene (diopside-augite) prisms also occur in the rock background. Commonly, on bigger prisms traces of their (100) cleve-ages are bent forming characteristic kink-bands. All rock-forming constituents of serpentinite are "covered" by very small magnetite microspherules, which locally form the cloudy-shaped assemblages.

The specimen of diopside-grossularite metasomatite (rodingite) is "patchy" in appearance, white-yellow in colour. Their structure is aphanitic, locally porphyroclastic. Occasionally, the ophitic intergrowths composed of small dark-green prisms embedded of white-yellowish fine-grained backgroud can be obser-ved. As it was confirmed under microscope, in the white, fine-grained parts of ro-dingite the framboidal idiomorphic garnets (up to 1 mm in size) predominate, which are sometimes intergroved with flaky Mg-chlorite (up to 2 mm in size). In the green-coloured parts of an ophitic intergrowths only prism-shaped pseu-domorphs (after primary pyroxenes?) filled of Mg-chlorite flakes replacing pristine fiber-shaped Ca-Mg amphiboles were ascertained. The narrow veins filled of recrystallised chalcedony also rarely occur there.

## GEOCHEMISTRY

Bulk-rock chemistry, trace and rare earth element determinations was per-for-med using XRF, INAA and ICP method in the Canadian Laboratory Ltd with valuable assistance of GeoAnaliza Enterprise (Cracow). Sample of antigorite serpentinite is characterized of normative harzburgite composition (#Mg= 90), whilst geochemistry of diopside-grossularite metasomatite is comparable with pristine pyroxene-gabbro (except their strong CaO enrichment).

On the MORB-normalized multielement diagram both serpentinite and rodingite show the same distribution profile. It is characterised by the presence of slight K, Rb, Ba, Th, Nb enrichment, and displays the strong Ti and slight Ce negative anomalies. Such similarity of profile line positions, which is observed for samples representing different members of ophiolite suite, indicate, that LIL abundances in these rocks recorded only chemical "equlibration" event.

Conditions for such LIL "homogenization" could have taken place during serpentinization or strong deformation including flow in the solid-state. Despite of this, interpretation of MORB-normalized diagrams in this case is not suitable for petrologic purposes.

On primary mantle-normalized REE spider-diagram can be observed similarity of the La, Ce, and Tb contents in the serpentinites and rodingites. Generally, in the serpentinites the MREE and HREE abundances are slightly depleted in comparison with PM values. The rodingites display slight sloped LREE profile with small negative Ce and positive Eu anomalies, whilst in the Gd-Lu range (20-30 time PM composition) the flattening of profile line is observed. It can reflect an important role of fractional crystalisation in the early stage of mineral separation from the melt (basic cumulates?).

## CONCLUDING REMARKS

The geochemistry results obtained for the Stobna serpentinite and rodingite may indicate, that they both represented fragments of the ancient oceanic crust. However, their primary chemical features (except REE components) were completely obliterated by advanced deformation and serpentinization of protholiths. Most probably the latter movements and shearing in the SMF zone could also the influence LIL mobility in the examined system. These reasons caused, that any attempts to detailed reconstruction of primary mantle-originated or magmatic processes of Stobna melange exotics could not be achieved using the traditional geochemical discrimination projections.

## REFERENCES


JAMROZIK L., 1981: Tectonic position of ultrabasite-basite massifs surrounding the Sowie Góry Mts. block, In: W. NARĘBSKI (ed.)., Ophiolites and initialites of northern border of the Bohemian massif. Guide-book of excursions in Poland, 2, 86-95

NARĘBSKI W., WAJSPRYCH B., BAKUN CZUBAROW N., 1982: On the nature, origin and geotectonic significance of ophiolites and related rock suites in the Polish part of Sudetes, Ofioliti 2/3 407-420

OBERC J., 1977: The gabbros and ultrabasites in the vicinity of the Gory Sowie Block , In: Geology of Poland, Tectonics, 4 163-168

WAJSPRYCH B., 1978: Allochtonous Paleozoic rocks in the Visean of the Bardzkie Mts. (Sudetes), Annales Geologorum Poloniae, 47, 99-128

WAJSPRYCH B., 1981 Serpentinite melange of Stobna stream valley and its tectonic significance. In: W. NARĘBSKI (ed.) Ophiolites and initialites of northern border of the Bohemian massif, Guide-book of excursions in Poland. 2, 95-113

WICKS F, WHITTAKER E. J.W., 1977: Serpentine textures and serpentinisation. Canadian Mineralogist, 15, 459-488.