

*Piotr GUNIA*¹

REMARKS ABOUT GEOCHEMISTRY OF THE ULTRABASIC ROCKS FROM
THE NOWA RUDA OPHIOLITE (SW POLAND)

Abstract: The preliminary geochemistry results of serpentinized harzburgites from the Nowa Ruda Ophiolite are presented. On the basis of bulk-rock chemistry and contents of traces and REE the hypothesis about pure magmatic origin of these peridotites is proposed. According to obtained results the Nowa Ruda primary harzburgites can be interpreted as a ultramafic cumulates from the lower member of ophiolite suite. They exhibit many features indicative for separation of orthopyroxenes and olivines from the residual mantle tectonites of the lowest parts of ancient oceanic crust. Alternatively, they may also be interpreted as a ‘mixed’ fragments of residual harzburgites intermingled with latter pyroxenitic or gabbroic cumulates from the overlying part in the ophiolite sequence.

Keywords: ophiolite suite, ultramafic cumulates, harzburgites, Nowa Ruda gabbro-diabase Massif

INTRODUCTION

The Nowa Ruda gabbro-diabasic massif (Nowa Ruda Ophiolite) is situated along SW margin of mountain part of Sowie Góry gneiss block. This geological unit, in the lithostratigraphic profile is subdivided on two parts. One, lower, which contain fresh or saussuritized norites, olivine-bearing gabbros, troctolites or clinopyroxenites. In their upper part the pillow metadolerites are widespread. At the present state of knowledge the gabbros and metadiabases are regarded as a middle and upper parts of dismembered ophiolite suite (Białowolska 1973, Borkowska 1985, Favzy-Marie 1986, Borkowska et al. 1989).

The main problem to explain is the position of ultrabasic rocks, which outcrop in the small area situated on the summit part of unnamed hill localized several tens metres on W from the Kmiotek hill near Wolibórz. The results of previous petrologic studies suggested, that they represent of apoharzburgitic antigorite serpentinites, which can to comparable with tectonite peridotites or olivine-pyroxene cumulates forming by crystals settling on the bottom of magma chamber (Borkowska et al. 1989). The determination of Sm-Nd whole rock ages indicate 353 ± 21 Ma age time span for gabbroic member equilibration event (Pin et al. 1988), whilst the underlying ultrabasites are unquestionably older.

¹ *Wroclaw University, Institute of Geological Sciences, ul. Cybulskiego 30, 50-205 Wroclaw, Poland; guniap@ing.uni.wroc.pl*

The aim of this study, is to attempt to recognize the position of Nowa Ruda ultramafic body in the ideal profile of ophiolitic sequence based on the geochemical features of mentioned rocks. However, considering the strong metamorphic changes of primary harzburgites, the interpretation of their bulk-rock, trace and REE chemistry must be conducted with great care.

METHODS

The 30 samples of serpentinites, which were taken from outcrops situated on the summit part of unnamed hill localized tens metres on W from Kmiotek hill near Wolibórz had been studied in thin sections in the transmitted light under polarisation microscope. From this collection two unaltered samples were selected for geochemical studies.

The Nb, Zr, Y, Sr, Rb, Ga and Ba abundances were determined using x-ray fluorescence method (XRF). Concentrations of Cu, Pb, Zn, Ni and V were determined using couple plasma-induced emission spectrometry (ICP method). Analyses of the Co, Cs, Hf, Sc, Ta, Th and U contents, and of the La, Ce, Nd, Sm, Eu, Tb and Yb contents were performed using a neutron-activation method (INAA). All determinations were carried out in the Activation Laboratory Ltd. (Canada) with valuable assistance of the "GEOANALIZA" Enterprise from Cracow.

Trace elements detection limits were as follows: 2 ppm for Cu, Nb, Ni, Rb, Sr and Zn; 4 ppm for Ga, Pb, Y, Zr; 14 ppm for Cr and V. In the case of other elements (including REE) it were: 1 ppm for Ce, Nd; 0.5 ppm for Th; 0.2 ppm for Ta, Hf, La also 0,05 for Tb, Eu, Yb and 0.01 ppm for Sm and Lu.

RESULTS

The Nowa Ruda harzburgites independently of advancing serpentinitization changes are chemically similar. They are high-Mg, low-Ti and enriched in Al_2O_3 and CaO with comparison with average chemistry of harzburgites. On the Coleman (1977) CaO- Al_2O_3 -MgO discrimination plot the projection points occupy of ultramafic cumulate field. Their normative mineralogy plotted on OPX-OL-CPX discriminative diagram shows points distribution at the field of harzburgitic composition.

The multielement trace elements diagram shows that the Nowa Ruda harzburgites are characterized by presence of slight HFSE depletion in comparison to MORB standard with slight selective enrichment in Rb, Th and Ta in the LILE range. The strong negative Ba anomaly is also visible.

The REE variations spider plots illustrate that abundances of LREE in the studied harzburgites are on level of chondrite composition, but MREE and HREE contents are 10-20 times higher than in chondrites. Probably it can reflect the secondary? enrichment during the residual liquid crystallization.

The obtained results are closely connected with previous geochemical interpretations of basites of Nowa Ruda ophiolite. In contrary, in these rocks the

strong HREE depletion is observed which is explained by removing of 50-80% initial volume of parent magma as a solidification process (Borkowska et al. 1989).

In author opinion, the studied ultrabasites recorded chemically only the early stage of shallow-level magma crystallization and total volume of solidification products left from the residual magma did not exceed 10% initial volume. Thus unquestionable confirming of magmatic affinity of described harzburgites with other basic members of Nowa Ruda Ophiolite suite is not possible and requires further geochemical or isotopic studies.

CONCLUDING REMARKS

Summing up, the obtained geochemistry results confirm previous opinions, according to harzburgites from Nowa Ruda Ophiolite represent early ultramafic cumulates. They exhibit many features indicative for separation of orthopyroxenes and olivines from the residual mantle tectonites from the lowest parts of ophiolite suite. Alternatively, they may also be interpreted as a 'mixed' fragments of residual harzburgites intermingled with latter pyroxenitic or gabbroic cumulates from the upper part of ophiolite sequence. The small area of occurrences of these interesting ultrabasites did not allow to explain all petrogenetic problems by traditional methods of petrological studies.

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