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COMPOSITION OF AMPHIBOLE AND PLAGIOCLASE IN AMPHIBOLITES FROM NORTHERN CONTACT ZONE OF THE KARKONOSZE GRANITE: A PRELIMINARY REPORT

INTRODUCTION

Northern part of the Karkonosze-Izera block, hereafter the Izera block, is composed mainly of different varieties of gneisses and granitogneisses partitioned by four latitudinal belts of metapelitic rocks: Złotniki Lubańskie, Mirsk, Stara Kamienica and Szklarska Poręba ranges, the latter one being situated along the northern contact zone of the Karkonosze granite and made up of metapelite-derived hornfelses. Both gneisses and metapelites abound in numerous dykes, veins and small, still often unmapped bodies of metabasites and amphibolites. These rocks particularly abundantly outcrop in the NE part of the Izera block, as well as within the Stara Kamienica belt, and have been recently the subject of detailed geochemical and petrological studies (e.g. Ilnicki 2001, Nowak 2001). Yet amphibolites occurring within the Szklarska Poręba range have not been thoroughly investigated hitherto giving thus the incentive for the present research inasmuch as such a study could provide valuable data necessary when considering and evaluating the influence of the Karkonosze granite on the rocks of the Izera block. First insights into chemical compositions of the rock-forming minerals of these rocks are briefly presented in this paper.

RESULTS

Amphibolite samples were collected along the Szklarska Poręba range between Rozdroże Izerskie in the west and Mniszy Las, the eastern tip of the belt. Electron microprobe analyses of 7 samples were performed with Cameca SX100 apparatus with the technical assistance of Dr P. Dzierżanowski and L. Jeżak. Chemical analyses of calcic amphiboles were recalculated applying 13eCNK method, while those of Mg-Fe-Mn amphiboles assuming that all Fe is ferrous.

Amphibolites are typically dark-green or dark-grey, fine-grained rocks, although coarse-grained variety is sometimes found. The rocks exhibit moderate to weakly developed foliation or thin lamination, at places with mineral lineation present; massive, randomly textured rocks are also found. Mineral composition is

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fairly monotonous. Rocks are composed of dark- and pale-green to colourless, usually elongated anhedral to subhedral amphibole prisms or acicular blasts, small equidimensional crystals of plagioclase, quartz, ilmenite±rutile±tytanite aggregates, Fe-oxides and accessory apatite, epidote, K-feldspar, chlorite, biotite and zircon. Sericitisation of plagioclase is widespread, whereas chloritisation of amphibole is only but sporadic.

Typically amphibole blasts are zoned yielding the composition of Mg-hornblende or even tschermakite in the core (Si^{4+} 6.4-6.9 p.f.u., X_{Mg}≈0.70) and less aluminous Mg-hornblede at the rims of the blasts (Si^{4+} 7.1-7.3 p.f.u., X_{Mg}≈0.75). In one sample the reversed zonation of the mineral was ascertained, with Si-rich core and Al-rich rims.

Besides calcic amphiboles, in some samples from the central and eastern parts of the Szklarska Poręba range, the monoclinic Mg-Fe-Mn amphibole, namely cummingtonite, is present (Fig. 1). In all of the samples in which it occurs its composition is quite homogeneous: Si^{4+}=7.98±0.03 p.f.u., X_{Mg}=0.61±0.01. Cummingtonite typically appears as discrete blasts accompanying or growing on hornblende crystals. Moreover, in one sample (WSG.w1) this is the only variety of the amphibole.

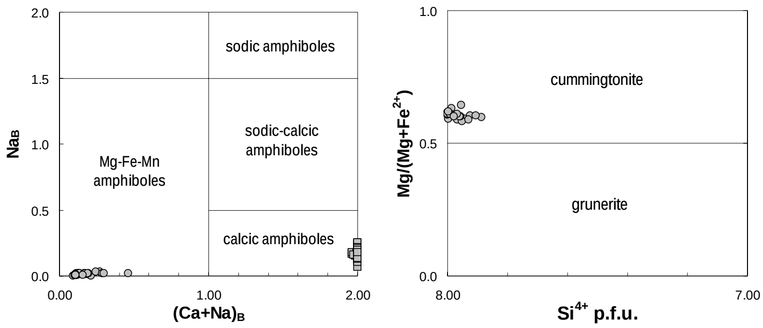

Fig. 1. Position of the analysed amphiboles on the classification diagrams (Leake et al., 1997): circles – cummingtonite, squares – Mg-hornblende and tschermakite.

Plagioclase composition is much varied. Typically it is bytownite-to-anorthite (An_{80-94}) or almost pure anorthite (An_{91-100}) in the homogeneous blasts and andesine/labradorite (An_{50}) in the core and bytownite (An_{80-85}) at the rim in the inversely zoned ones. Occasionally relics of oligoclase (An_{11-20}) and andesine (An_{37-40}) are found. In one sample (WSG 4.7) plagioclase composition was less calcic ranging from oligoclase (An_{29}) in the core to labradorite (An_{63}) at the rim.

DISCUSSION AND CONCLUSIONS

Composition of amphibole and plagioclase points to amphibolite facies conditions of regional metamorphism of the studied rocks, which is similar to amphibolites from the Stara Kamienica range (Ilnicki, *op. cit*). Moreover, cummingtonite is supposed to appear as a product of the regional metamorphism

(Smith and Phillips, 2002) indicating LP/HT amphibolite facies conditions (Janak et al., 1996). On the other hand, cummingtonite crystallisation in amphibolites implies the reaction of the tschermakitic component of the amphibole with silica, resulting in the consequent appearance of anorthite (Evans and Ghiorso, 1995). The reaction is preferred by decreasing pressure and it seems conceivable that in favourable conditions cummingtonite might appear as the product of the contact metamorphism of metabasites (cf. Yardley, 1989). Thus, the presence of cummingtonite, at least in some samples, may be indicative of the thermal influence of the nearby Karkonosze granite on the studied rocks. Perhaps it is not unlikely that the presence of An-rich plagioclase or anorthite itself may be another indication to a possible high-temperature (contact?) metamorphism of the investigated rock.

Thus the composition of the rock-forming minerals in the investigated rocks may suggest an overprint of the amphibolite facies conditions of regional metamorphism by the hornfels-amphibolite facies conditions of thermal metamorphism which probably resulted from the emplacement of the Karkonosze granite. Depending on the distance from the pluton, amphibolites either have not been affected by the emplacement of the pluton (judging by the low An concentration in plagioclase, as in the sample WSG 4.7) or affected only partially what led to high An content in plagioclase (± crystallisation of cummingtonite), or eventually – as in the extreme case of sample WSG.w1 – the mineral assemblage of amphibolite was transformed from *Mg-hornblende + andesine/labradorite* to *cummingtonite + anorthite*. However, the comprehensive recognition of the metamorphic processes in the studied area requires further intense petrological research.

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