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RETROGRESSION METAMORPHISM OF ULTRABASIC ROCKS FROM
GÓRY SOWIE BLOCK AND SUDETIC OPHIOLITE, SW POLAND

GEOLOGICAL SETTING

The Góry Sowie block (GSB) and Sudetic ophiolite are situated at the north-eastern border of the Bohemian massif. GSB is composed of gneisses and minor granulites, ultrabasic and metabasic rocks. Numerous small ultramafic bodies of ambiguous origin occur within the GSB (e.g., Gunia 1997). Their contacts with host gneisses are generally obscured. Timing of garnet growth in GSB peridotites was evaluated at about 400 Ma and it is considered as the age of emplacement of the peridotites into granulites (Brueckner et al. 1996). The GSB ultramafic-basic xenoliths include harzburgite-orthopyroxenite with minor melanocratic norite (CIPW norm). Composition of a relict Cr-spinel (Fig. 1) and olivine (Fo₉₀) assemblage unequivocally prove the mantle origin of ultramafic rocks.

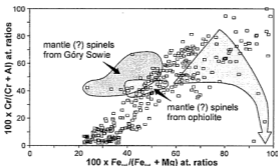


Fig. 1. Cr/(Cr+Al) vs. $Fe_{Mg}/(Fe_{Mg}+Mg)$ diagram for spinels from GSB ultramafic rocks (empty rectangles) and serpentinites from Sudetic ophiolite (light grey areas); fields of mantle spinels defined on the basis of petrographic observation and spinel chemistry.

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The Sudetic ophiolite represents almost complete ophiolite sequence adjacent to the GSB. Three serpentinite massifs surround GSB are considered as dismembered mantle tectonite section (e.g., Majerowicz 1979, Dubińska and Gunia 1997). The Jordanów-Gogołów serpentinite massif (JGSM) is located close to GSB northern border. Peridotites of JGSM are scarce and randomly distributed, while completely serpentinitized rocks are frequent. Composition of ultramafic rocks suggests that serpentinites were formed at the expense of harzburgites and lherzolites (Dubińska and Gunia 1997). Numerous bodies of felsic rocks regarded as Variscan granite apophyses occur within the serpentinite massifs (e.g. Dubińska and Szafrank 1990, Dubińska et al. 1995, Bylina 1996).

The aim of the paper is to compare retrogression path recorded by GSB ultramafic xenoliths and serpentinite massifs surrounding GSB, that are considered as mantle tectonites of ophiolitic sequence.

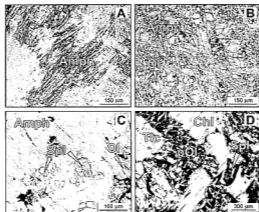


Fig. 2. Metaperidotites from Sudetic ophiolite and GSB. A. Acicular tremolite (Amph) in serpentinite-talc rock from contact zone, Jordanów Śl. (JGSM) one polar; B. Ultramafic rock containing relict olivine (Ol) intergrown with tremolite prisms (Amph), Wiry (JGSM), one polar; C. Edenitic amphibole (Amph) with hercynite (Spl) inclusions and mesh olivine (Ol) in metaperidotite, Niedzwiedź hill, GSB, one polar; D. Chlorite (Chl)-talc (Tlc)-skeletal spinel (Spl) intergrowth and pseudomorphs after olivine (pOl) in metaperidotite, Niedzwiedź hill, GSB, crossed polars.

RESULTS

Metamorphic assemblage in GSB ultramafic xenoliths consists of enstatite (up to 0.18 Al apfu) – olivine ($F_{0.85-0.9}$) – amphibole (different Al-, Na-, and Ti-contents) – MgAl-spinel (Cr# 2-6, Fig. 1), where MgAl-spinel forms inclusions inside olivine ($F_{0.85}$), orthopyroxene and amphibole (Fig. 2C). Chlorite–hercynite intergrowths (Fig. 2D) are probably products of melt pockets metamorphism. Ser-

pentine minerals, and minor talc, magnetite, cummingtonite, tremolite, phlogopite, and brucite represent the younger metamorphic assemblage. The mineral chemistry, e.g., amphibole and spinel compositions (Fig. 1 and Fig. 3), records a continuous decrease of metamorphic grade.

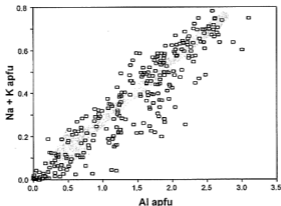


Fig. 3. Na+K apfu (atoms per formulae unit) vs. Al apfu diagram for amphiboles from GSB ultramafic rocks; grey arrow shows evolutionary trend from high-grade to low-grade metamorphic conditions; selected element contents (apfu) range as following: Al up to 2.5, Ti up to 0.16, Na up to 0.7, K up to 0.14.

Serpentinites from JGSM, representing different textural varieties and mineralogy, typically contain relict holy-leaf Cr-spinel surrounded by ferrichromite and/or magnetite rim (Fig. 1, see for details Dubińska 1995, Dubińska and Gunia 1997). Amphibole, predominantly close to tremolite in composition, occurs in contact schist surrounding granite-type apophyses and adjacent serpentinites (Fig. 2A and 2B).

DISCUSSION AND CONCLUSIONS

Parent ultramafic rocks from Sudetic ophiolite and GSB were generally similar as suggested by mantle spinel composition (see for details Dick and Bullen 1984). On the other hand GSB metaperidotites typically contain Al-rich major components suggesting a modification of primary chemical composition by K-poor and Al-rich melt of unknown origin.

Different mineralogy of the GSB and ophiolitic metaperidotites clearly reflect distinct metamorphic paths. GSB metamorphic assemblage record retrogression path starting from eclogite via amphibolite up to greenschist/zeolite facies metamorphism. Geothermal gradient of eclogite HP→amphibolite facies episode, 10–15° C/km, suggests subduction zone metamorphism, while amphibolite→zeolite facies episode documents a continental metamorphic episode (20–25° C/km, Bylina

et al. 2001). The textures and mineralogy of Sudetic ophiolite serpentinites record early zeolite facies serpentinization that produced pseudomorphic lizardite serpentinites. Geothermal gradient of the early serpentinization was estimated at 120° C/km (Dubínska et al. 2001) indicating ocean-floor metamorphism. Successive greenschist facies metamorphic recrystallization produced antigorite serpentinites (Dubínska 1995, Dubínska and Gunia 1997). Dubínska et al. (1995) estimated metamorphic pT conditions (2.1–2.6 kbar, <400° C) on the basis of amphibole chemistry from contact zones depicting posterior continental metamorphic episode.

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