

*Jacek PUZIEWICZ<sup>1</sup>, Joanna GURGUREWICZ<sup>1</sup>, Wojciech BARTZ<sup>1</sup>*

**PETROLOGY OF QUARTZO-FELDSPATHIC SCHISTS  
FROM THE NIEMCZA-KAMIENIEC METAMORPHIC UNIT  
(EASTERN PART OF THE FORE-SUDETIC BLOCK, SW POLAND)**

The Niemcza – Kamieniec Metamorphic Unit is situated in the eastern part of the Fore-Sudetic Block, to the east of the Góry Sowie Gneissic Block and the Niemcza Zone. The Unit is dominated by mica schists, which were subjected to late Variscan mylonitization in its northern part, supposedly together with the rocks of the Niemcza Zone (Mazur and Puziewicz 1995). Thin (first hundreds of meters) layers of rocks called traditionally quartzo-feldspathic schists occur within the mica schists of the Niemcza – Kamieniec Metamorphic Unit (Dziedzicowa 1966). Detailed petrological study of the quartzo-feldspathic schists occurring in the type locality in Kawia Góra was presented by Ciukszo and Puziewicz (1992). In this paper we present the mineral chemistry data comprising the whole outcrop of the rock as well as the results of the study of quartz crystal preferred orientation. The quartzo-feldspathic schists formally are the (Bt)-Ms-Pl-Kfs-Qtz gneisses, but the traditional name will be used in the following to avoid confusion with the earlier published papers.

The schists consist of fine-grained, layered quartzo-feldspathic matrix embedding variable amounts of K-feldspar porphyrocrysts of size up to 4 mm. The layering is due to alternation of quartz-dominated and feldspar-dominated layers of thickness 100 – 500  $\mu\text{m}$ ; the latter contain small amounts of micas and are locally enriched in opaques. Locally the micas form well-defined streaks within the feldspar-dominated layers. The porphyrocrysts – free schist varieties occur as well.

The schists contain 72 – 77 wt % of  $\text{SiO}_2$  and typically are rich in potassium (up to 9 wt % of  $\text{K}_2\text{O}$ , corresponding to ca 53 % of orthoclase in the CIPW norm; Ciukszo and Puziewicz 1992). Potassium-rich rhyolitic tuffs (Dziedzicowa 1966) or arkoses (Kölbl 1930) were considered to be their protolith,

The grains of plagioclase have the size ranging from 0.02 to 2 mm and contain from 4 to 18 % An. Their composition is related neither to the position in the rock fabric nor to their size. Plagioclase grains are not zoned. The K-feldspar occurring in the matrix contains 98 – 92 % Or. Muscovite is relatively rich in Fe and Mg (up to 0.9 atoms of Fe + Mg pfu,  $\text{O}^{2-} = 22$ ) and contains significant Si excess (up to 7 atoms pfu). Biotite is most often partly decomposed, which is visible in microprobe analyses totals lowered by 2 - 4 wt % relative to theoretical value of ca. 96 wt %. The scatter of mineral compositions in a scale of thin section is great, and is similar

---

<sup>1</sup> *Institute of Geological Sciences, University of Wrocław, ul. Cybulskiego 30, 50-205 Wrocław, Poland; e-mail: jpuz@ing.uni.wroc.pl*

to that described from the Kawia Góra schists by Ciukszo and Puziewicz (1992). The compositions of plagioclase and micas and their variability are similar over the whole quartzo-feldspathic schist outcrop.

The study of quartz <c> axes preferred orientation (Gurgurewicz and Bartz 2000, 2001, and unpublished data) shows that the quartzo-feldspathic schists deformation comprised a prevailing coaxial component (plain strain, general constriction or general flattening) and less significant simple shear component, with a top to the SSW (sinistral) sense of movement. A top to the SSW shearing is also documented by the asymmetry of feldspar porphyrocrysts pressure shadows. The schists varieties rich in K-feldspar porphyrocrysts seem to be strained to a lower degree than those devoid of porphyrocrysts. The quartz <c> axes patterns show no relationships to the structure of the host schist. Slips in <a> direction on various planes were important deformation mechanism in quartz, and no evidences of slips in [c] direction were found. This suggests the temperature of deformation to be lower than 550-600 °C (Okudaira et. al. 1995).

The mineral chemistry data indicate that the minerals forming the schists are not in chemical equilibrium. Ciukszo and Puziewicz (1992) have shown that biotite was not stable during the metamorphic event that shaped the schists from the Kawia Góra and water was available in restricted amounts. The observations of the schists coming from other places lead to similar conclusions. The restricted amount of water lead to incomplete equilibration of white mica. The presence of albite and silica-magnesium-iron rich white mica suggests that the quartzo-feldspathic schists were formed under low-grade metamorphic conditions.

*Acknowledgments* . This study is a part of the KBN grant no 6 P04D 057 20.

#### REFERENCES

- CIUKSZO B., PUZIEWICZ J., 1992: Petrology and mineralogy of the Kawia Gora quartzo-feldspathic schists (Niemcza region, Lower Silesia, Poland). *Miner. Polon.*, 23 (2), 53-66.
- DZIEDZICOWA H., 1966: The schist series east of the Niemcza Zone in the light of the new investigations. In: "Z geologii Ziemi Zachodnich", Oberc J. (ed.), Wrocław, 101-119 (in Polish).
- GURGUREWICZ J., BARTZ W., 2000: Quartz <c> axes fabric in the quartzo-feldspathic schists from the northern part of the Niemcza-Kamieniec Żąbkowski Metamorphic Unit – preliminary results. *Pol. Tow. Mineral. Prace Spec.*, 17, 154-155.
- GURGUREWICZ J., BARTZ W., 2001: Petrography and quartz fabric in the quartzo-feldspathic schists from the central part of the Niemcza-Kamieniec Żąbkowski Metamorphic Unit. *Pol. Tow. Mineral. Prace Spec.*, 19, 58-60.
- KÖLBL L., 1930: Über den Gebirgsbau der Sudeten. *Centralbl. Mineral. Geol. Paläont. Abt. B. Jg 1930*: 463-473.

- MAZUR S., PUZIEWICZ J., 1995: Mylonites of the Niemcza Zone. *Ann. Soc. Geol. Polon.*, 64, 23-52 (in Polish, English abstr.).
- OKUDAIRA T., TAKESHITA T., HARA I., ANDO J.-I., (1995): A new estimate of the conditions for transition from basal  $\langle a \rangle$  to prism  $[c]$  slip in naturally deformed quartz. *Tectonophysics*, 250, 31-46.