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STRUCTURAL AND MINERALOGICAL EVIDENCE
OF EVAPORITE PROTOLITH OF THE BIESI KAMIEŃ QUARTZ-ROCK,
WESTERN KACZAWA COMPLEX

Abstract: The Biesi Kamień quartz-rock (Western Kaczawa Complex) composed of 98.0 - 99.5% SiO₂, till now interpreted as a large quartz vein has been reinterpreted to be Si-metasomatic rock developed from the evaporite, gypsum-anhydrite-salt protolith. Despite of the complete replacement of former minerals, the crystalline structure expressed by silica pseudomorphs after gypsum, dolomite, halite and other salt minerals is well preserved. The idiomorphic shapes of silica pseudomorphs and the common presence of length-slow chalcedony unequivocally document the vanished evaporites. The totally silicified evaporites are considered to be a large, about 400 m in diameter and some tens (up to 150) meter thick, slab-like exotic block related to the Lower Carboniferous Jędrzychowice/Ludwigsdorf wildflysch succession.

Keywords: silicified evaporites, length-slow chalcedony, wildflysch, Sudetes.

INTRODUCTION

The authors' recent studies on geology of the Jędrzychowice rock-unit have led to a discovery of the new in scale of the Lugo-Sudeticum, evaporite series (the Biesi Kamień evaporite series, Wajsprych & Achramowicz 2003). It is recognised as a protolith of quartz-rock of the Biesi Kamień hill. Well preserved primary depositional structures with characteristic square and rhomboidal outlines of the former evaporite minerals as well as common presence of length-slow chalcedony, seem to be univocally identifying the evaporite nature of the Biesi Kamień quartz-rock. Some observations indicate a composed, gypsum/selenite-anhydrite-salt facies composition of this evaporite series. Presentation of diagnostic features of the evaporite nature of the Biesi Kamień quartz-rock protolith and some implications of this fact is the aim of this report.

GEOGRAPHIC AND GEOLOGICAL SETTING

The discussed quartz-rock crops out on slopes of the Biesi Kamień Hill, north of Jędrzychowice village, in the Zgorzelec/Görlitz region of the Polish/German frontier zone (Fig. 1). The Biesi Kamień quartz-rock is situated in a northwestern part of the Jędrzychowice rock unit, defined by Wajsprych & Achramowicz (2003) as a boundary zone between the Görlitzer Schiefergebirge and the Western Kaczawa units (for review see Kozdrój et al. 2001). Recently published Geological

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Map of the Lausitz-Jizera-Karkonosze (Kozdrój et al. 2001) presents the area of the Jędrzychowice rock-unit as a part of a large geological unit assembling the Görlitzer Schiefergebirge and a northern part of the Western Kaczawa complex. These authors describe this unit as build-up of stratigraphically coherent, Lower-Middle Paleozoic volcano-sedimentary succession dominated with Lower Cambrian carbonates, mostly dolomites), shales, and mafic volcanics and pyroclastics, and Lower Carboniferous undivided graywackes, shales (partly fyllites), limestones and conglomerates.

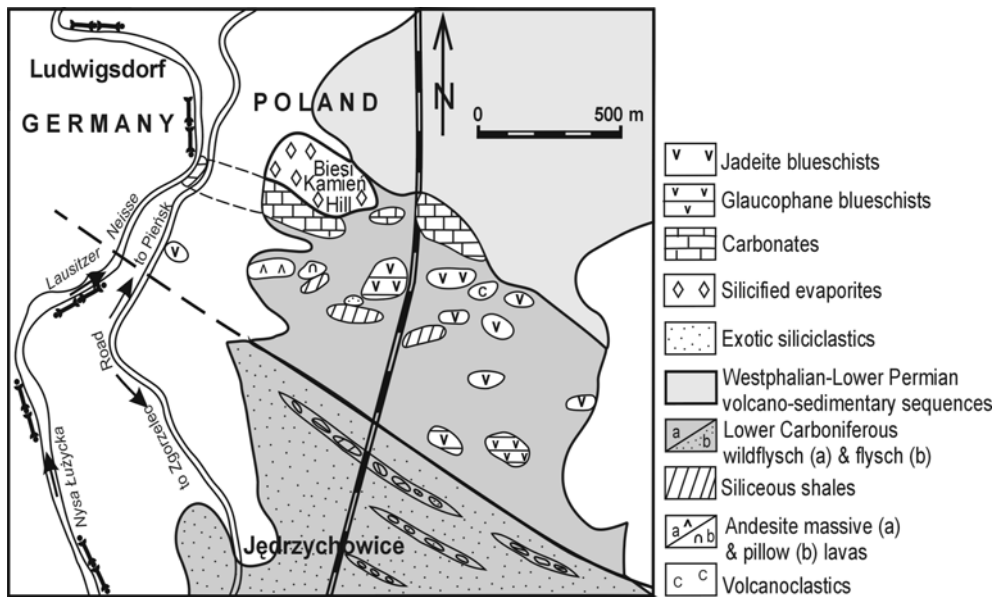


Fig. 1 Geological sketch-map of the Jędrzychowice region.

Wajsprych & Achramowicz (2003) interpreted the Jędrzychowice rock-unit to be a large-scale, extremely chaotic, olistostrome-rich, and large olistolithes bearing wildflysch succession of typical *mélange* composition. Most of the exposed metabasite bodies have appeared to be the blueschists (Wajsprych, Achramowicz 2003, Achramowicz, Wajsprych, this volume).

The discussed quartz-rock is marked till now as a large quartz vein, connected with a fault zone dividing the Jędrzychowice and the Westphalian-Rotliegende, terrestrial, red-beds-type volcano-sedimentary successions (see geological maps by Frydrychowicz & Frydrychowicz (1959) and Milewicz et al. (1979/1989). Śliwa (1967), who described some peculiar petrographic features of this rock, like a presence of the „...limonite chalcedone, losenge and square, post-magnetite pseudomorphs in some parts of the rock...”, emphasized its peculiarity among the other quartz veins of the Sudetes and connected it with the Variscan orogenic complex.

MACRO- AND MICROSCOPE DESCRIPTION

The Biesi Kamień quartz-rock crops-out in two small quarries and some rocks. It is a part of more composed sequence comprising also carbonate (mostly dolomite) and siliceous deposits (Wajsprych, Achramowicz 2003). Two facies-set have been separated within the protolith of the quartz-rock lithosome: (i) – gypsum (selenite), mostly coarse to very coarse crystalline to fine grained anhydrite deposits, and (ii) – salt dominated deposits.

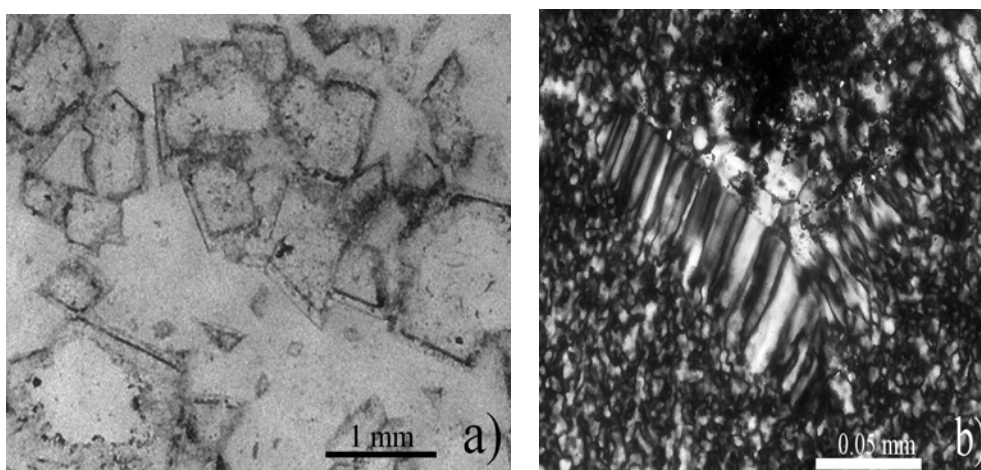


Fig. 2. Microphotographs of structure of silicified evaporite (a) and length-slow chalcedony developed on the rim of the (dolomite) crystal.

The quartz-rock of the selenite protolith, which formerly was described as brecciated veiny quartz (Śliwa 1967) looks really like a breccia composed of broken quartz fragments of honey-yellowish colour. In fact, it is composed of silicified coarse crystalline gypsum. Individual crystals, usually some centimeters long, in some parts rich 30 cm and more; some of them show perfectly protected original crystallographic forms. The gentle laminated, fine grained, light gray rock observed in some parts of selenite series has the features of anhydrite intercalations, developed probably rather due to diagenetic, dewatering than primary, sedimentary processes. The salt protolith of other parts of the quartz-rock is inferred from the commonly observed cube-outlines of different sizes.

Another argument in favour of the evaporite nature of the Biesi Kamień quartz-rock protolith is a length-slow chalcedony, a common component of the quartz mineralogy of the quartz rock in question. It has been observed as very thin layers which envelope the sharp outlines of the primary evaporite minerals in many samples of the Biesi Kamień quartz-rock (Fig. 2a). The layers are composed of distinctly transversely laminated silica (Fig. 2b). It is also probable that much of felt-like microcrystalline quartz of the rock background is also length-slow chalcedony but cut more or less perpendicularly to the fibre axes.

DISCUSSION

The length-slow chalcedony, very rare in the nature, is one of two mineralogical varieties of chemically precipitated microquartz in sedimentary rocks. These two varieties differ with a position of c-axis regarding the fibres; c-axis in the length-slow chalcedony is parallel to the fibres, while that of length-fast one is perpendicular.

According to results of Folk & Pittman's (1971) studies, the length-slow chalcedony occurs exclusively in association with sulfates and evaporites. This statement has been giving an „...absurdly simple criterion revealed by use of the gypsum plate, has enabled astonished identification of evaporite sediments where no evidence of such had been hitherto expected.” (Folk, Pittman 1971, p. 1046). The words above precisely reflect the situation presented in this paper; where, the 100% silica rock, till now interpreted as quartz vein, have appeared to be totally silicified evaporite (gypsum-anhydrite-salt) sequence. Since, reported here-up results on a total and large-scale silicification of evaporite sequence can be treated as strong (and still expected) positive test of the Folk & Pittman's hypothesis. On the other side, redefinition of the Biesi Kamień quartz-rock as primary evaporites places the question mark on some other rock series of the Sudetes and other parts of the Variscan orogen as being suspected to be silica-metasomatised evaporites and other chemically deposited rocks, what may essentially influence the concept of the tectonic and geodynamic evolution of the orogen.

REFERENCES

- ACHRAMOWICZ S., WAJSPRYCH B., 2004: First Sudetic occurrence of jadeite in metabasalts. This volume.
- FOLK R.L., PITTMAN J.S., 1971: Length-slow chalcedony : A new testament for vanished evaporites. *Journal of Sedimentary Petrology*, 41: 1045-1048.
- FRYDRYCHOWICZ E., FRYDRYCHOWICZ M., 1959: Geological Map of the Sudetes, Zgorzelc, 1:25000. Instytut Geologiczny, Warszawa.
- KOZDRÓJ W., KRENTZ O., OPLETAL M., (Eds.), 2001: Geological Map Lausitz-Jizera-Karkonosze (without Cenozoic sediments), 1:100 000, and Comments, Państwowy Instytut Geologiczny, Warsaw, 64 pp
- MILEWICZ J., SZAŁAMACHA J., SZAŁAMACHA M., 1979/1989: Mapa Geologiczna Polski, 1:200000, Arkusz Jelenia Góra, Wyd.Geologiczne, Warszawa.
- ŚLIWA Z., 1967: Żyła kwarcu z Jędrzychowic koło Zgorzelca. (In Polish with English summary), *Przegląd Geologiczny*, 6: 289-291.
- WAJSPRYCH B., ACHRAMOWICZ S., 2003: On the new wildflysch-to-flysch, blueschist-rich Lower Visean succession of the Western Sudetes (SW Poland). *Annales Societatis Geologorum Poloniae*, 73: 123-137.