POLSKIE TOWARZYSTWO MINERALOGICZNE – PRACE SPECJALNE
MINERALOGICAL SOCIETY OF POLAND – SPECIAL PAPERS
Zeszyt 26, 2005; Volume 26, 2005

Agnieszka DŁUGOSZEWSKA[1]

MINERALS FROM PEGMATOIDS OF THE NORTHERN PART OF THE KARKONOSZE MASSIF COVER

Abstract: The rocks of the Garby Izerskie zone bear numerous vein-like pegmatite bodies, exposed at "Stanisław"quartz quarry. Minerals such as: tourmaline, rutile, apatite, chlorite, löllingite, native bismuth, cassiterite, scheelite, feldspar, muscovite, biotite, fluorite, zircon, monazite, xenotime, have been found and described in this work. Microscope and microprobe studies of these minerals are presented. The determinations of chemical composition of these minerals pointed out that they have similar chemical composition to the minerals found in pegmatites of the Karkonosze massif.

Keywords: "Stanisław" quarry, fault zone, microprobe analyses, trace elements, apophyses

INTRODUCTION

The Garby Izerskie contact zone is located within the boundary zone of the Karkonosze massif and metamorphic Izera rock series (Fig. 1). This silified fault zone is several kilometres long and it spreads in SW - NE direction (Fila-Wójcicka 2004). The zone is cut by number of transversal dislocations. The rocks filling this dislocation are variable: on the SE side there are hornfelsed schists. In the northern part there are several types of gneisses.

Garby Izerskie fault zone is connected with a tectonic unit of the Sudetes Mountains, named Karkonosze – Izera block, consisted of the Karkonosze granite massif and its metamorphic envelope – Izera area (Mazur 2002).

The Karkonosze massif (Kozłowski 1978) is an intrusion of Variscan age and it consists of granites of several types. The Karkonosze granite bears vein rocks, mainly aplites, pegmatities, lamprophyres, quartz rocks.

The Izera area, consisted of polygenic gneisses (Izera gneisses) and granites (Rumburk granites), divide into four paralell schist zones (Mazur 2002). Due to alteration of Izera gneisses there are metasomatic rocks in this area, mainly leucogranites and greisens.

METHODS

About 50 samples were collected during field works in "Stanisław" quartz quarry. Chemical composition of minerals in pegmatoids were determined by the CAMECA SX 100 electron microprobe at the Inter – Institution Laboratory for Microanalysis of Minerals and Synthetic Substances (Faculty of Geology, Warsaw University) with technical assistance of Dr. Piotr Dzierżanowski.

PEGMATOIDS OF THE GARBY IZERSKIE ZONE

Numerous pegmatoid veins appear in the Garby Izerskie fault zone. They are exposed in "Stanisław" quarz quarry (about five kilometers north of Jakuszyce), where they cut hornfelses.

[1]*Institute of Geochemistry, Mineralogy and Petrology, Faculty of Geology, Warsaw University, al. Żwirki i Wigury 93, 02-089 Warszawa, e-mail: agnieszka.dlugoszewska@uw.edu.pl*

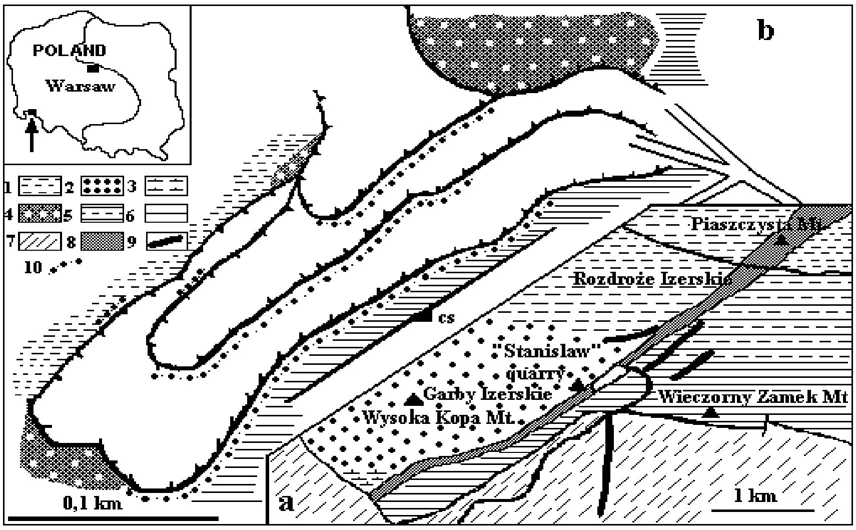

Fig. 1. a) Geological sketch of the Garby Izerskie zone and its vicinity, b) map of "Stanisław" quarry (Kozłowski 1978); 1 – Izera gneisses, 2 – granite gneisses, 3 – porphyric granite-gneisses, 4 – blastomylonitic gneisses, 5 – cordierite-bearing gneisses, 6 – biotite hornfelses, 7 – Karkonosze granites, 8 – quartz zone, 9 – vein rocks, 10 – granite apophyses, cs – skarn rocks.

Pegmatoids in quarry "Stanisław" are filled with aplite granite. The aplite is leucocratic and it consists of quartz, feldspar, muscovite, biotite, chlorite, sometimes fluorite and tourmaline, rarely chabasite, cleavlandite, hornblende and ore minerals (Madalińska 1983). In addition, the matasomatic albite and chloritized biotite are rather common. A gradation of crystal dimentions is observed in veins. Commonly it is a continous increase toward the central parts of veins, but sometimes it is a decrease. The granite in veins can be also coarse–grained. In many parts it consists of quartz and feldspar, sometimes of biotite or muscovite. It happens that granitoid veins are cataclased. The cracked parts are strongly chloritized, then pyrite is found as well. There are parts of veins which are disintegrated during the process of desilicification, so the clayey substance appears (Kozłowski 2004).

MINERALS OF PEGMATOIDS

Feldspar dominates in the samples. It formes xenomorphic crystals, associated with quartz and micas. Often it is observed in veinlets which cut other minerals, for example tourmaline. WDS analyses of chemical content reveal that there is the presence of trace elements such as caesium and rubidium. Single crystals occurs higher contents of these elements (0,13 % wt Cs, 0,30 % wt Rb) in comparison with feldspar in veinlets (0,01 % wt Cs, 0,22 % wt Rb).

Muscovite is very common. It occurs as single platy crystals or it fills small veins, associated with feldspar or quartz. Sometimes it forms inclusions in other minerals. As it results from the WDS determinations, muscovite has caesium and rubidium in its composition. In single white crystals an increase of caesium concentration (0,52 – 0,75 % wt Cs) is accompanied by a decrease of rubidium content (0,35 – 0,44 % wt Rb). The caesium increase is followed by an increase of iron content too.

Chlorite appears either as individual grains, or in grained aggregates, where its small crystals associate with muscovite, quartz, feldspar. Sometimes chlorite fills tiny veinlets. Analysed crystals belong to ferric chlorites group.

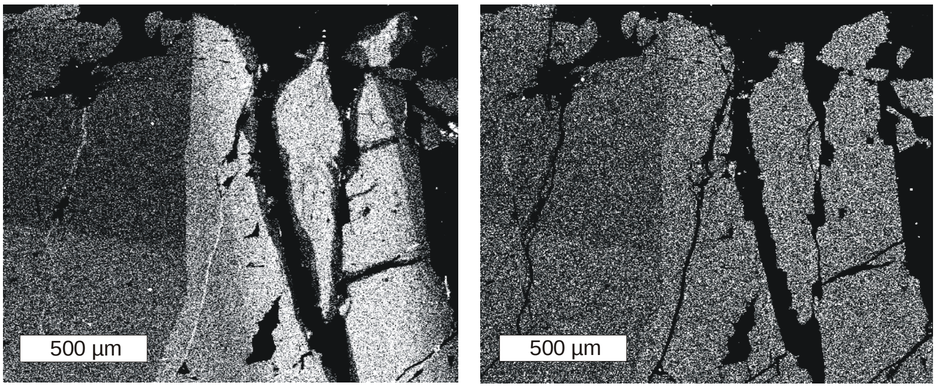

Fig. 2. BSE images of tourmaline crystals - Mg (left) and Na (right) distribution.

Tourmaline appears as euhedral elongated crystals of variable size, often strongly cracked. They have often inclusions appearing as grains of quartz, mica or feldspar. Mica and feldspar are in veinlets cutting tourmaline too. Tourmaline crystals are zonated. WDS determinations show that studied crystals have chemical composition similar to buergerite or foitite compositions. Analyses of zones differing in colour display some changes of elements contents. These changes are present in distribution of iron, silicon, aluminium, sodium (Fig. 2), manganese, magnesium (Fig. 2).

Apatite forms small euhedral crystals, and it appears as inclusions in albite. The results of WDS analysis indicate that it is fluoricapatite with high content of manganese reaching 5,36 – 4,00 % wt MnO.

Cassiterite is dominant ore mineral in veins (ore minerals are accesory minerals here). It forms grains with sharp edges. Some of them are strongly porous. Several grains are zonated. WDS analyses of the parts differing in colour reveal that this zonation show changeable amounts of tin, titanium and tantalum. Titanium and tantalum occur as admixtures – 0,39 – 1,34 % wt TiO_2 and 2,34 – 0,60 % wt Ta_2O_5.

Rutile occurs as tiny, xenomorphic crystals. It often appears as porous grains. Rutile associates with feldspar or muscovite. It is found as included small grains in muscovite. There is zonation in crystals, but it is not common. WDS analysis allow to ascertain that these grains contain niobium – 3,45 % wt and tantalum – 0,59% wt in composition.

Native bismuth crystals are rarely found. Small xenomorphic grain included in löllingite are observed during electrone microscope observations. The X – ray spectrum measured on EDS spectrometer shows clearly that these grains consist of bismuth.

Zircon occurs rather seltom. During electrone microscope observations it is obseved as often oval – shaped grains. Sometimes grains are porous. They associate with apatite, xenotime, monazite. Zircon crystals also form inclusions in chlorite, feldspar or quartz. It happens that single zircon grains have inclusions of other minerals. The results of EDS analysis indicate that uranium oxide is a substance building included grains inside zircon crystals. Analysed crystals contain hafnium – 2,93 % wt HfO_2 and uranium – 0,60 % wt UO_2.

Monazite and xenotime are occasionally observed under electrone microscope. They appear together, and associate with apatite and zircon. They are crystals of the skeletal habit, so they are supposed to be in an initial stage of growth.

During this work many unidenified phases were found. They are secondary minerals. WDS and EDS determinations detect the presence of such elements as: uranium, arsenic, niobium, tungsten, titanium, iron, calcium, tantalum, manganese. As these substances are strongly porous, the poor quality of the surface of their grains makes impossible to be certain of the results of analyses. So the studies over these minerals will be continued.

CONCLUSIONS

Abundant mineralization was ascertained in the pegmatoids of the Garby Izerskie zone, at "Stanisław" quartz quarry. Mineral associations in veins of Garby Izerskie are similar to minerals found in pegmatites and aplogranites of Karkonosze and in greisens of the Izera area. These similarities yeld conclusion that the veins can be apophyses of the Karkonosze pluton.

Muscovite and feldspar contain low amounts of rubidium and caesium, which is the result of metasomatism (connected with influx of fluids rich in boron, fluorine, sodium and potassium) taking part in later crystallization of veins. Rubidium and caesium, as they are mobile elements, were easily removed by fluids. Then such minerals as tourmaline, fluorite, apatite could grow.

Like in pegmatites of Karkonosze and Izera greisens, ore mineralization (tungsten – tin – bismuth) was ascertained in pegmatoids of the Garby Izerskie zone. Such minerals as löllingite and cassiterite are the most common among ore minerals. The others like native bismuth, scheelite and Nb-bearing rutile, are seltom, as they are strongly scattered. This ore mineralization create small concentrations, so its significance is only scientific.

Secondary minerals containing uranium, arsenic, niobium, tantalum, titanium etc. can confirm the thesis about strong connections between the Garby Izerskie zone and the Karkonosze pluton. It is known that Karkonosze granites and pegmatites consist of minerals containing these elements (*e.g.* uranium mineralization in Kowary). This mineralization is probably developed under the influence of metal-bearing fluids which came from cooling pluton and altered primary minerals of pegmatoids.

REFERENCES

FILA-WÓJCICKA E. 2004. Rb-Sr isotope studies in the Garby Izerskie zone – evidence for the Karkonosze intrusion activity. *Pol. Tow. Mineral. Prace Spec.,* 24, 153 – 156.

KOZŁOWSKI A. 1978. Pneumatolytic and hydrothermal activity in the Karkonosze – Izera block. *Acta Geol. Pol.,* 28 (2), 172 – 221.

KOZŁOWSKI A., METZ P. 2004. Sequence and conditions of the silicification events in the Garby Izerskie dislocation zone, Sudetes. *Pol. Tow. Mineral. Prace Spec.,* 24, 243-246.

MADALIŃSKA M. 1983. Pegmatoids of the Garby Izerskie contact zone, W Sudetes, Poland. *Arch. Mineral*., 39 (1), 66 – 75.

MAZUR S. 2002. Geology of the Karkonosze – Izera Massif: an overview. *Pol. Tow. Mineral. Prace Spec.,* 20, 22 –34.