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# SULPHIDE MINERALIZATION IN DIABASES FROM NIEDŹWIEDZIA GÓRA NEAR CRACOW

Abstract. Traces of sulphide mineralization were for the first time found in the diabase (basaltic trachyandesite) sill in Niedźwiedzia Góra near Cracow. Using ore microscopy and scanning electron microscopy the authors have identified pyrite, chalcopyrite-like mineral (haycockite) and very rare pyrrhotite. The form of occurrence of these sulphides in relation to the other rock-forming minerals of the diabase seems to indicate their post-magmatic, hydrothermal origin.

*Key-words*: diabase, basaltic trachyandesite, Niedźwiedzia Góra, pyrite, chalcopyrite, haycockite

## INTRODUCTION

Permian volcanic rocks in the vicinity of Krzeszowice, West of Cracow, have been investigated for more than a century. The first modern petrographic description of these rocks was done by Rozen (1909). A comprehensive review of more recent papers was given, among others, by Muszyński (1995), who has established a systematic position of the rocks in question according to the classification recommended by the Subcommission on the Systematics of Igneous Rocks of IUGS.

The rock in question are built essentially of basic or intermediate plagioclases, diopsidic augite or hypersthen, olivine (usually altered to so-called leptochlorites), apatite, ilmenite and titanomagnetite (Rozen 1909; Czerny, Muszyński 1997). According to Muszyński (1995), chemical composition of these rocks places them in the TAS diagram mainly within the field of basaltic trachyandesites.

Up to now the trace of sulphide mineralization in Permian volcanic rocks in the vicinity of Krzeszowice were mentioned only in few papers, i.e. traces of chalcopyrite and probably also haycockite in the dark, andesite-like rhyolites

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from Zalas (Musiał, Muszyński 1996), a small amount of pyrite, chalcopyrite, pyrrhotite and probably also cobaltite in hornblende andesites (in the current systematic — trachyandesites) from Dubie (Harańczyk 1980; Muszyński, Pieczka 1992) and traces of pyrite and chalcopyrite in the porphyry of Dębnik laccolith (Muszyński, Pieczka 1994).

In this paper the authors have described sulphides found for the first time in the diabase from Niedźwiedzia Góra. So far the occurrence of sulphides has been found in the endocontact zone of these diabases (Muszyński, pers. commun.).

## EXPERIMENTAL

Few polished sections from the samples representing the lower part of diabase sill were investigated under the ore microscope (Phot. 1, 2). Fore semiquantitative chemical analyses of sulphide minerals the scanning electron microscope (JEOL 5200 with Link Exl attachment) was used.

## RESULT AND DISCUSSION

Under the ore microscope magnetite and ilmenite exhibit typical intergrowth. Separate grains of these minerals are observed rarely. Magnetite contains thin lath-type crystals of ilmenite. These structures are typical of Fe-Ti ores of magmatic origin. No other spinels were observed in investigated samples.

Some dozens of xenomorphic pyrite and chalcopyrite grains occur as inclusions in iron oxides and interstitial filling. Pyrrhotite is very rare. Some

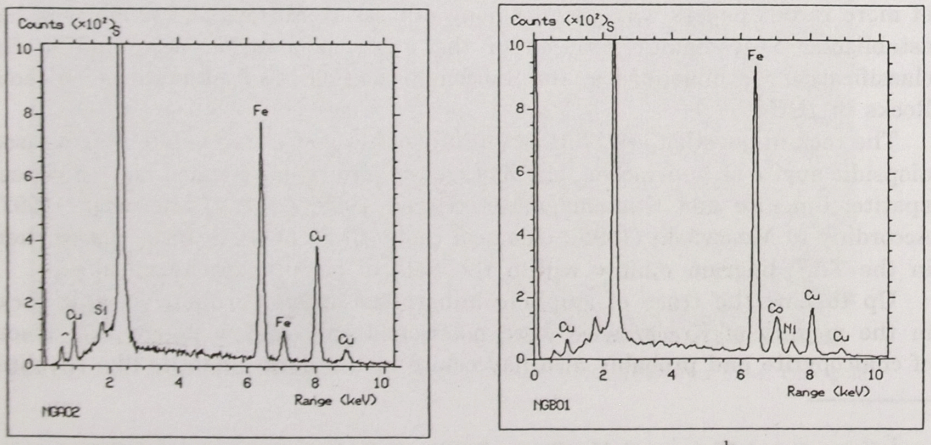


Fig. 1. SEM-EDS spectra of: a — chalcopyrite, b — pyrite



crystals of chalcopyrite reveal brighter tint of yellow colour and under crossed polars have distinct anisotropy. Such a variety of chalcopyrite is usually determined as haycockite. The next evidence for presence of haycockite is the lack of visible, surface oxidation (Cabri, Hall 1972). Surface of chalcopyrite grains oxidizes quicker than mentioned above haycockite. Haycockite is a typical mineral of sulphide association from basic magmatic rocks. In Poland this mineral has already been described from the Krzemianka basic rock complex (Kucha 1982). In some places reactive character of sulphides is observed (Phot. 1, 2). Chalcopyrite and pyrite replaced some magnetite grains and silicates (Phot. 1, 2).

The spectrum presented in Fig. 1a is typical of chalcopyrite, whereas that shown in Fig. 1b indicates pyrite containing small amount of Cu, Co and Ni. It cannot be excluded that these elements occur, at least in part, as submicroscopic inclusions of other sulphides.

Two type of ore associations have been distinguished in the investigated diabases. The first one is composed of Fe-Ti-oxides that were formed during magma crystallization. The second association is formed by Fe- and Cu-sulphides. These sulphides are most probably of hydrothermal origin.

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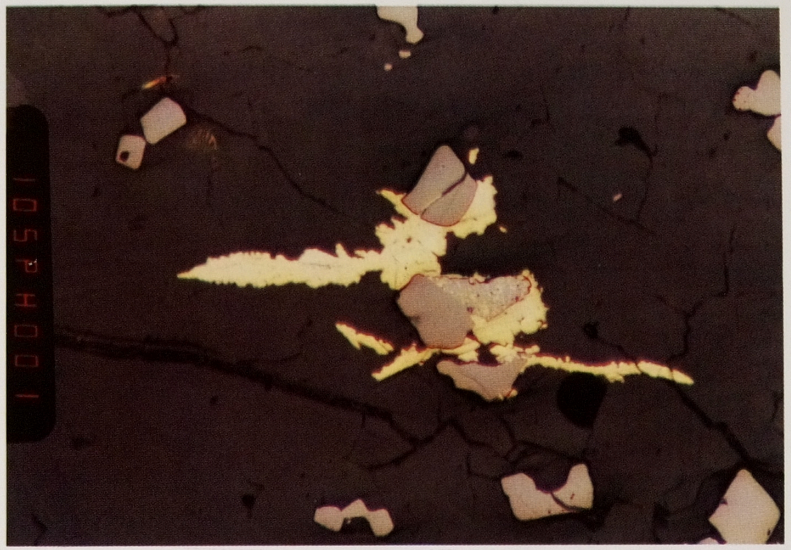
## MINERALIZACJA SIARCZKOWA W DIABAZACH Z NIEDŹWIEDZIEJ GÓRY KOŁO KRAKOWA

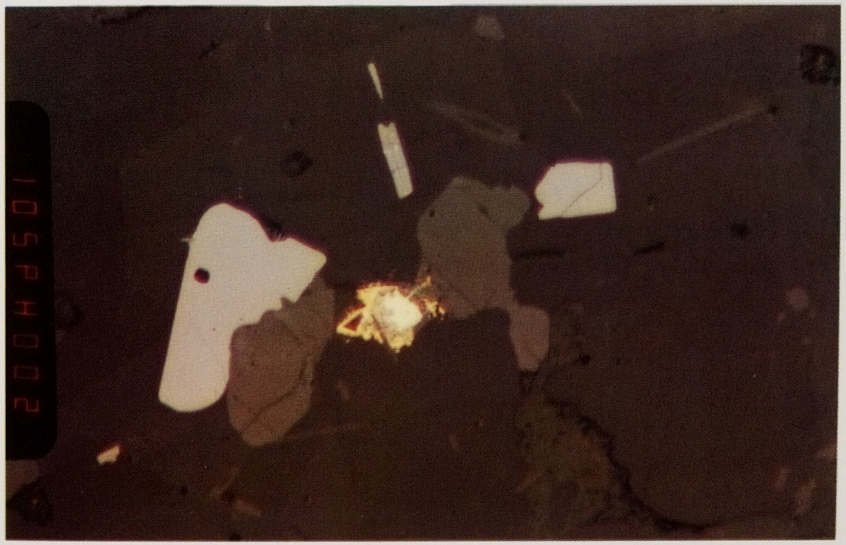
Streszczenie

W diabazach (bazaltowych trachyandezytach) z Niedźwiedziej Góry rozpoznano ślady mineralizacji siarczkowej. Na podstawie badań wykonanych za pomocą mikroskopu kruszcowego oraz elektronowego mikroskopu skaningowego (z przystawką do analizy chemicznej) zidentyfikowano piryt, chalkopiryt (haycockit), a także występujący w bardzo niewielkiej ilości pirotyn. Sposób występowania tych siarczków w stosunku do minerałów otaczających zdaje się wskazywać na ich pomagmowe, hydrotermalne pochodzenie.





Phot. 1. Chalcopyrite (yellow) replaces magnetite (grey). Reflected light, magn. 600×



Phot. 2. Pyrite (white) and chalcopyrite (yellow) replace magnetite (grey) and silicates (dark grey). Reflected light, magn. 1200×

A. PIESTRZYŃSKI, J. SKAMRA, M. MARSZAŁEK — Sulphide mineralization in diabases from Niedźwiedzia Góra near Cracow