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**CONTACT METAMORPHISM OF THE LOWER CARBONIFEROUS
LIMESTONES, THE SZKLARKA VALLEY NEAR KRAKÓW,
SOUTHERN POLAND**

INTRODUCTION

Late Carboniferous and Early Permian igneous activity in NE margin of the Upper Silesian Block resulted in a number of small volcanic bodies. One of the examples is a small dike from the Szklarka Valley, the outcrop known in the literature as "the old border" (Szajnocha 1890). It is located in the Dębnik anticline, the structure build of Middle and Upper Devonian and Lower Carboniferous limestones and dolomites shaped by the rhyodacite laccolith of a diameter of 3 km (Muszyński and Pieczka 1996, Kurbiel 1978, Lewandowska 2000).

Igneous rocks of the Dębnik anticline and they influence on the country rocks have been studied since the XIX century. The outcrop from the Szklarka valley was first described by Szajnocha (1890), who found a volcanic rock, which forms a 2 m thick dike cutting through dark Carboniferous limestones. It is strongly altered and has the composition of high-K rhyolite (Muszyński and Pieczka 1996).

In the contact zone the limestones were altered to white or grey marble (Szajnocha 1890). The results of chemical analysis of the rock were interpreted as follows (Siemiradzki 1890): all CO₂ was assigned to calcite, Fe₂O₃ to hematite and Al₂O₃ to kaolinite. The remaining elements were recalculated as wollastonite. Wollastonite, grey-green epidote and needles of colourless tremolite were determined by microscope (Siemiradzki 1890). Grossular was also mentioned but the evidences of identification were not presented.

Subsequent research did not confirm this mineral assemblage (Rozen 1909). Gawęł (1953) and Kozłowski (1955) suspected that Siemiradzki studied ksenolith brought to the surface by the intruding volcanic rock.

Hereby we present the results of XRD and SEM-EDS studies of the altered carbonate country rocks.

METHODS

Samples were gently crushed and carbonates were removed with sodium acetate-acetic acid solution buffered at pH 5. The remnants were analysed by X-ray powder diffractometry (XRD). The observation of crystals' habit was performed with a scanning electron microscope (SEM) coupled with an energy dispersive spectrometer (EDS).

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RESULTS

The limestones at the exact contact are not metamorphosed. The alteration zone neighbours the upper part of the dike and extends about 200 m to the south-west. In this zone thermal alteration caused whitening of the rocks and calcite recrystallisation. Microscopic observations showed equidimensional calcite mosaic, lacking lattice preferred-orientation. The size of calcite blasts ranges from 0.05 up to 0.5 mm. Pores (of a size of 0.5 mm) are infilled with chalcedony recrystallised to quartz crystals. Iron oxides are dispersed in small lenses. Bigger calcite crystals have common inclusions of small, prismatic and single needle-like crystals. The prismatic ones are subhedral diopside crystals up to 20 μm long. Their average mineral composition basing on SEM-EDS data is $\text{Ca}_{1.06}\text{Mg}_{0.98}[\text{Si}_{1.98}\text{Al}_{0.10}]\text{O}_6$. The diopside identification was confirmed by XRD analysis (Fig. 1). Rare needle like crystals, about 5 μm long and 0,1 μm thick, corresponds probably to tremolite described by Siemiradzki (1890), are too small for unequivocal identification. Additionally 7 \AA sheet-silicates (S) were detected (Fig. 1) with crystals smaller than <2 μm . Insoluble residue composes less than 0.1 wt % of the rock.

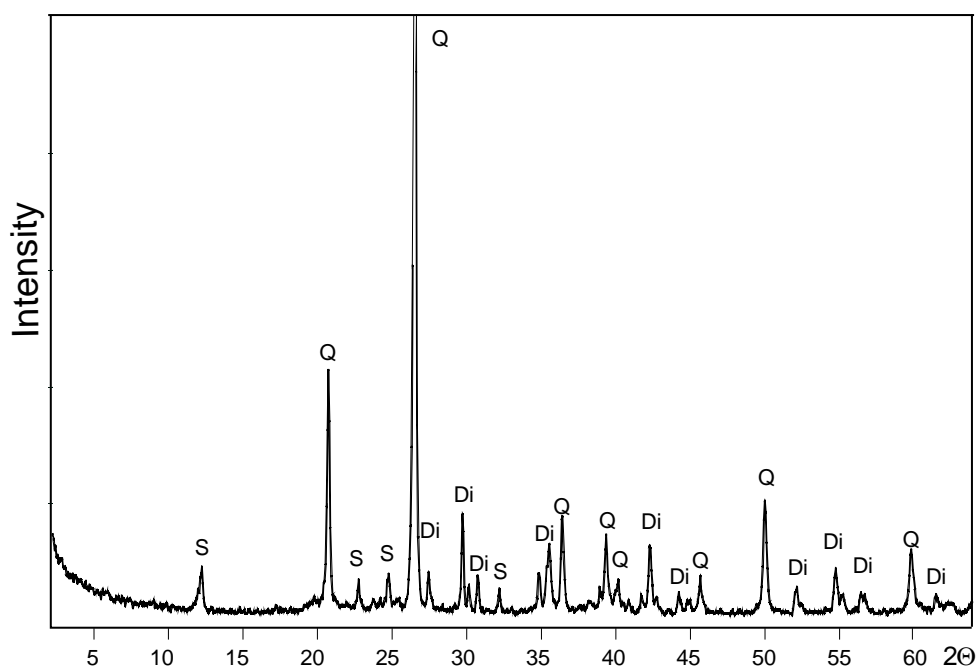


Fig. 1. XRD pattern of the insoluble residue (Q-quartz, Di-diopside, S-sheet-silicates).

SUMMARY

The present mineralogical investigations did not confirmed the presence of wollastonite and grossular described by Siemiradzki (1890).

This investigation revealed the presence of quartz, diopside and 7Å sheet-silicates with equivocal tremolite.

Absence of contact alteration at the margins of the Szklarka volcanic rocks suggests that the contact metamorphism was not caused by the small dike visible in the outcrop. The cause of the thermal alterations must be assigned to the rhyodacite laccolith of the Dębnik anticline.

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