

Preliminary results of mineralogical investigations of Cambrian rocks from the Pieprzowe Mts. (Sandomierz Upland, Poland)

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The mid-Cambrian rocks exposed in a topographic scarp adjacent to the Vistula River within the Pieprzowe Mts. (Sandomierz Upland, South East Poland) were the subject of preliminary petrological and mineralogical studies. The Pieprzowe Mts. are a unique geological feature because of their unusual pepper-like coloured weathering cover.

The Pieprzowe Mts. are a stratotype area for the Pieprzowe Mts. Shale Formation (mid-Cambrian) defined by Orłowski (1975). This formation consists of the following sedimentary and meta-sedimentary rocks: clay shale, quartz-mica schist, quartzite and conglomerate. Despite over 150 years of research on this formation some geological and mineralogical problems are still awaiting explanation (for example the origin of phosphate nodules in conglomerate layers). The scarcity of fossils and complicated tectonic structure of the formation are the reasons why its sequence stratigraphy is especially difficult to detect. Trilobites characteristic for the mid-Cambrian were found only at one locality within the conglomerate layers, and this age was extrapolated to other units of the Pieprzowe Mts. Shale Formation. Michniak (1969) claims that the same age cannot be ascribed to the whole rock succession because of petrographic diversity of the constituting rock types. Kowalczewski (1995) suggests that

the age of the formation should be extended from the Early Cambrian to Early Ordovician (Early Tremadocian). Majority of research devoted to the Pieprzowe Mts. strata focused on stratigraphy, sedimentology and tectonic analysis. Petrographic descriptions of those rocks were given by Samsonowicz (1916, *vide* Orłowski 1964) but mineralogical analyses were done rather sporadically (Kuhl 1931a, b, Michniak 1969).

This paper is devoted to the preliminary mineralogical description of quartz-mica schists and quartzites. The analysis involved observations under transmitted light polarizing microscope. In addition, scanning electron microscopy (SEM) equipped with Energy Dispersive Spectroscopy detector (EDS) was used.

During preliminary studies of quartz-mica schists, it was found that quartz, which is a dominant component of this rock occur as both, terrigenous grains and authigenic filling of veins. Quartz is also present within the lithic grains of quartzites that are common in the quartz-mica schists. Kaolinite appears in two genetic forms: (1) as a product of mica transformations, and (2) as an authigenic mineral. Accessory mineral assemblage consists of zircon, framboidal pyrite and Ti-oxides. The Fe-oxides result from chemical weathering.

In the mineral composition of quartzites angular, xenomorphic, nonundulatory quartz

prevails, which is locally impregnated with phosphates. A single grain of apatite was encountered. Very fine veins composed of secondary carbonates occur within the rock. Accessory minerals are represented dominantly by pyrite, which does not have the framboidal character typical for sedimentary rocks.

In the light of the aforementioned preliminary results, it is inferred that these rocks were subjected to strong diagenesis and bear traces of hydrothermal processes. Presence of apatite in quartzites sheds a new light on the problem of the origin of phosphate nodules within the conglomerates. According to the present study, the authors suggests that the quartzites may be older than the quartz-mica schists, based on the presence of quartzite lithic grains within them.

This paper informs about the research project aiming to characterize the weathering products occurring within the Pieprzowe Mts. It can be observed that a lot of secondary minerals is present here such as: kaolinite, alunite (Kuhl 1931a, b), Fe and Mn-oxides. It seems that weathering processes and their products are still not sufficiently explained. There is a hypothesis that jarosite could

also form here. Further research will be carried out using various analytical techniques to improve our understanding of these processes.

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