

Petrographic Characteristics of Mafic Pebbles from the Selected Conglomerate Horizons in Lower Silesia (SW Poland)

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The Upper Devonian–Lower Carboniferous sedimentary rocks in the Sudetes often contain thin horizons of conglomerates with rounded pebbles of mafic, intrusive or meta-volcanic rocks.

The aim of this study is to present preliminary data concerning petrography of mafic pebbles from conglomerates representing the Upper Devonian and Lower Carboniferous sedimentary rocks in the Sudetes. The study was focused on pebbles of mafic rocks from Upper Devonian of the Bardo Structure Unit, Upper Devonian of the Świebodzice Depression (north of Sowie Góry Block) and from Lower Carboniferous (Culm) clastic rocks filling grabens on the of the Sowie Góry Block gneisses.

Many questions concerning the origin and deposition of mafic pebbles in these conglomerates have not been sufficiently explained yet. The most important problems to study are the petrography and geochemistry of basic pebbles and their correlation with the occurrences of other mafic rocks in the Sudetes. Similarly, the conditions and mechanisms of diagenetic changes resulting in the origin of the conglomerate horizons are still unknown. This data should determine the source regions and transport directions of the primary basic rocks.

The main topic of the present petrographic studies are the characteristics of mafic pebbles occurring in the Świebodzice Depression (Witoszów Górny, Pogorzała and Lubiechów villages), Sowie Góry Block (Sokolec and Glinno) and Bardo Structure (the "Wapnica" quarry near Dzikowiec).

Mafic pebbles from the Świebodzice Depression represent three petrographic varieties: pyroxene gabbros (strongly altered), metabasalts with relicts of fluidal texture and laminated meta-pyroclastic rocks. All the studied pebbles are up to several cm in size, generally well or moderately rounded. Discoidal and spherulitic forms predominated here. As described above, relicts of vesicles were found in the metabasalts. The greenschists facies metamorphism of these pebbles is evidenced by the presence of secondary zoisite, clinozoisite, epidote and chlorites.

The mafic pebbles from the area between Sokolec and Ludwikowice Kłodzkie in the Sowie Góry Block are represented mainly by gabbros. There are olivine gabbros, pyroxene-olivine gabbros and olivine gabbros. They are well rounded and display many shapes from discoidal to spherulitic. Their sizes range from several cm to 20 cm. Medium-grained gabbros sometimes exhibit oriented texture. Altered, saussuritized plagioclases, intergrowths of clinopyroxene and secondary Mg-chlorite and uraltic hornblende are commonly observed. Some gabbroic pebbles contain well-preserved primary clinopyroxenes (endiopside), plagioclases (An_{50-70}) and olivines (Fo_{89-91}).

The mafic pebbles found on top of "Ostrzew" Hill near Glinno are composed mainly of kersantites. The well-rounded fragments of lamprophyres occur mainly at the contact zone between fine-grained laminated greywackes and mudstones. These vein rock pebbles are brownish and pale grey in colour and display different roundness ranging from discoidal to fusiform. Their diameter reaches up to 15 cm. Crushed relicts of primary amphiboles, altered plagioclases and disseminated Fe oxides predominate in rock composition.

Large (up to 2.5 m in size) blocks composed of mafic rocks are present at the bottom of abandoned "Wapnica" Quarry near Dzikowiec (Bardo Structure). Most of them are gabbros strongly altered by metamorphism and weathering. The four rock varieties of these blocks were distinguished on the basis of petrographic studies. They are as follows: coarse-grained plagioclase-chlorite rocks (primary anorthosites?), medium-grained, plagioclase-chlorite rocks containing relicts of clinopyroxenes (primary pyroxene gabbros?), zoisite-bearing amphibolites with non-oriented textures and laminated amphibolites (locally plagioclase-amphibole schists).

It is necessary to underline that the mafic rocks of the pebbles from the Bardo Structure underwent strong metamorphism and weathering. In many cases, their primary petrographic features were completely obliterated. Interestingly, all of the primary dark minerals of the Bardo pebbles are chloritized and carbonatized, whilst alteration did not influence the plagioclases (An_{52-68}), which are generally fresh.

The above presented results of petrographic studies indicate that several petrographic types of mafic rocks can be distinguished in the mafic pebbles from conglomerate horizons of Upper Devonian and Lower Carboniferous sedimentary units. The predominance of gabbros in the studied collection suggests, that many of them may have been transported from the Nowa Ruda, Braszowice or Ślęza ophiolite suites. The alimentation terrain for pebbles composed of metabasalts or amphibolites is difficult to be determined now.

The metabasalts and laminated meta-pyroclastics from the Świebodzice Depression may have originated probably in the Kaczawa Metamorphic Unit, whereas the source of amphibolite pebbles of the Bardo Structure may be represented by metabasic rocks of the Kłodzko Metamorphic Unit.

Geochemical and isotope studies of mafic pebbles are actually in progress and their future results will help to resolve many problems concerning the derivation, transport directions and alimentation terrains of the mafic pebbles studied.