

## MARMAROSH DIAMONDS – THE TYPICAL ASSOCIATION WITH THE ORGANIC MATTER IN THE OUTER CARPATHIANS

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The Marmarosh diamonds (MD) – a special type of the quartz, locally called *dragomites* – occur in the Outer Carpathians over a widespread area in a distinct paragenesis with different hydrocarbonic compounds. Since their description by TOKARSKI (1905), the MD have been a study object for about a century aiming at explanation of the phenomena of mineral formation and characteristics (e.g. VOZNYAK *et al.*, 1973; KOZŁOWSKI *et al.*, 1996). In Polish and Ukrainian territories, the following areas have been defined as examples of MD occurrence: the Mszana Dolna (Poland) tectonic window – KARWOWSKI & DORDA (1986); HURAI *et al.* (2002), the Rabe region (Bieszczady Mts., Poland) – JARMOŁOWICZ-SZULC & DUDOK (2005), the Stavne village vicinity (Ukraine) – DUDOK & JARMOŁOWICZ-SZULC (2000).

Despite their above described occurrence, the MD have in general a very characteristic euhedral crystal habit, transparency and a perfect reflection (KARWOWSKI & DORDA, 1986). There is a combination of rhombohedra ( $10\bar{1}1$ ) and ( $01\bar{1}1$ ), rare trigonal pyramid ( $11\bar{2}1$ ) and hexagonal prism ( $10\bar{1}0$ ). In the studied samples, that last one is often short or totally reduced.

The observed MD are present in the fissures, either as crystals in quartz veins or in the Carpathian fractures filled additionally with other minerals as calcite (at least two generations), traces of ore mineralization (e.g. pyrite) and the organic matter. The presence of primary or of secondary hydrocarbon inclusions is a characteristic phenomenon of the MD. Those primary ones observed in three sample areas, may be divided into three phase groups of state, being of homogeneous or heterogeneous nature. The solid inclusions comprise different bitumens, while the liquid inclusions are filled with different non-mixing fluids. Gas inclusions contain methane with some admixtures of heavier hydrocarbons, nitrogen and occasionally carbon dioxide. The heterogenic inclusions contain different types of the filling, e.g. gas and liquid hydrocarbon and the aqueous solution; gas and heavy hydrocarbon and the aqueous solution and solid bitumens *etc.* Heavy bitumens are rare in quartz. When present, they are responsible for the black colour of the crystals. Such feature was

observed in the Rabe region together with a relatively long crystal form, *i.e.* with a well-developed hexagonal prism. The Mszana Dolna area is full of quartz crystallized directly on the fissure walls, with calcite veinlets in the neighbourhood, tectonically disturbed. Such quartz is observed eastwards, too, in the tectonically engaged places. In other localities, individual crystals occur in “pockets” with black organic matter. For the vein formations of the Eastern Carpathians, the presence of anthraxolite is shown (DUDOK *et al.*, 2002).

Based on the studies conducted *pT* conditions of the mineral formation may be stated as: high pressure values in the Mszana region (0.75–2 kbar, compare: HURAI *et al.*, 2002), lower in the Rabe vicinity (0.9–1.7 kbar, JARMOŁOWICZ-SZULC & DUDOK, 2005) and the highest near Stavne (2.4–2.7 kbar, DUDOK & JARMOŁOWICZ-SZULC, 2000). Temperatures fall into a wide interval, while local differences enable a wide regional discussion of the formation history.

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