# Genetic Conditions of the Hydrothermal Mineralization from the Surroundings of Tišnov

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Hydrothermal mineralization was studied at the localities of Dřínová and Dolní Loučky (active quarries), Květnice (old galleries) and Štěpánovice (old quarries). The investigated area is formed by rocks of the Moravian Svratka Dome. Crystalline basement is represented by the Svratka gneiss (equivalent of the Brno Massif) with its Devonian sedimentary cover (quartzites, limestones). The Moravian Nappe (only at Dřínová) is built by the Bílý potok phyllites. All rocks were low-grade metamorphosed.

Calcite-barite veins crosscut all rock types. They always strike NW-SE and steeply dip (from 70 to 90°). Their thickness ranges from 1 cm to 2.5 m. Their filling is dominated by carbonates (especially calcite, less frequently dolomite and aragonite) and barite. Fluorite and quartz are rare. Ore minerals are present too. Most common is chalcopyrite and hematite, galena, marcasite and goethite occur less frequently, and traces of pyrite, sphalerite, bravoite and tetrahedrite are also present.

Polyphase development of the mineralization was identified, with three mutually tectonically separated mineralization stages (dolomite, calcite-barite-fluorite and aragonite one).

Homogenization temperatures of the fluid inclusions range between 45 and 125 °C. Generally, they decrease from the oldest minerals to the youngest one. With regard to the fact that only negligible pressures inside inclusions were found (e.g., about 1 MPa in fluorite), the homogenization temperatures correspond probably to the real temperatures of origin.

Cryometric measurements revealed the presence of fluids of the NaCl-$H_2O$ and NaCl-$CaCl_2$-$H_2O$ systems in fluid inclusions. Salinity of the hydrothermal fluid fluctuates considerably (0 - 24 wt. % NaCl equiv.) depending on the evolution of mineralization. Low salinity is characteristic for initial dolomite stage; then the salt content gradually increases (scalenohedral calcite), maximum was observed in fluorite followed by a decrease in concentration (barite, quartz) down to zero values (”cannon” calcite).

Analysis of the fluid inclusion leachates from fluorite and barite proved fundamental changes in contents of the dissolved salts (especially NaCl, $CaCl_2$ and $MgCl_2$). Relatively high concentrations of some ore elements were found in fluorite inclusions, too (0.05 to 0.1 wt. % each of Pb, Zn and Ba).

Carbon isotopic composition of the parent fluid was about -7 per mil (i. e. ”deep” carbon, but more probably it is the carbon of homogenized Earth´ s crust). Sulfur isotopes of sulphides show large dispersion (-7.7 to +8.2 per mil), probably caused by Eh changes. Source of sulfur can be found in the host rocks. Oxygen isotopic composition of the water in parent hydrothermal solution, from which carbonates crystallized, ranges between -2.3 and +1.4 per mil SMOW. This indicates the presence of marine or meteoric water in the hydrothermal system.

From the presented results it can be concluded that crystallization of minerals was conditioned especially by temperature decrease and by compositional changes (dilution with meteoric water, Eh changes) of hydrothermal fluid. Fluid, from which fluorite and barite originated, is similar to the sedimentary basins brines as indicated by its chemical and isotopic composition. These brines are waters of primary marine or meteoric origin and their chemical composition was significantly altered through interactions with rock environment at relatively low temperatures.