HUBBARD M.S., 1989. Thermobarometric constraints on the thermal history of the Main Central Thrust zone and Tibetian Slab, eastern Nepal Himalaya. *Journal of Metamorphic Geology*, 7: 19-30.

SCHÄRER U., 1984. The effect of initial ^{230}Th disequilibrium on young U-Pb ages: the Makalu case, Himalaya. *Earth and Planetary Science Letters*, 67: 191-204.

SIMPSON R.L., PARRISH R.R., SEARLE M.P. and WATERS D.J., 2000. Two episodes of monazite crystallization during metamorphism and crustal melting in the Everest region of the Nepalese Himalaya. *Geology*, 28: 403-406.

VANCE D. and HARRIS N., 1999. The timing of prograde metamorphism in the Zanskar Himalaya. *Geology*, 27: 395-398.

Documentation of Geological and Archaelogical Featu-res Using the Lacquer-Film Method

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For eight years now, Dolmat has been the only company in the Czech Republic to produce lacquer-films, marketing them both in the domestic market and abroad. Lacquer-films usually represent attractive sedimentary formations. Our company specializes in producing films of moldavite-bearing sediments, rarely with moldavites in situ. Such films are taken immediately after a moldavite has been found in the sediment. Lacquer-films are suitable for scientific centres and museums, for decoration of offices, exhibition premises and other interiors, pleasing geologists, collectors and laymen alike. Being of a high aesthetic value, lacquer-films chequer technology-governed interiors, bringing a genuine and original touch of nature and its history to the place. The method employed makes it possible to take lacquer-films from any loose-material (unconsolidated soil, clay, sand, gravel, peat, and debris or deposits formed by erosion) profiles ranging from pits to walls to excavations. Special preservative procedures allow to move such films of outcrop to offices, outlets, classrooms or apartments, or store them as unique documentary samples in museum depositories.

The production method is quite simple. Having been smoothed, a selected section of the outcrop or profile is sprayed with diluted penetrative lacquer hardening the material without affecting its texture, colour, or mineral composition. After a while, the prepared area is hardened once more, with undiluted lacquer this time, and covered with a thin cloth. Having dried up, the cloth is carefully torn away with a thin screen of the lacquer-hardened soil preserving the natural appearance of the original with all its features. Such a sheet of several dm^2 to m^2 is then fitted to a board and framed, and can be treated as an ordinary picture hung on a wall.

Each lacquer-film is an original, a true and permanent representation of a piece of nature. Besides having indisputable scientific qualities, it can serve as a decoration. Thanks to the documentation method, which is used in archaeology, geology, sedimentology and pedology, one can admire what an artist nature is.

The Neoidic Fluorite Mineralization in the Brno Massif: Interaction between Fluid and Rock

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The Brno massif is the largest and oldest igneous massif at the eastern margin of the Bohemian Massif. From the mineralogical point of view, numerous small occurrences of fluorite are typical of this granitoid unit. Detailed mineralogical and formation conditions study allow to distinguish several types of fluorite mineralization in granitoid rocks. The youngest one is most likely a neoidic mineralization (Mesozoic?–Quaternary?). This type has been found at three sites (Tetčice near Rosice u Brna, Rakšice near Moravský Krumlov and Květnička Hill near Tišnov).

The studied hydrothermal veins containing fluorite trend NW-SE, to lesser extent NE-SW, with a steep dip. Drusy coating, inexpressive banding and breccias are typical structures of the mineralization. A mineral composition is very simple at all localities. The veins consist only of quartz, fluorite and calcite. Fine-grained quartz is minor. A light to dark violet, light green or colourless fluorite predominates. Considerable amount of calcite is present only in veins near Tetčice. Minerals precipitated in the following succession: quartz-fluorite--calcite.

Several methods were used to establish origin of the mineralization: cathodoluminescence microscopy, REE geochemistry of fluorite, fluid inclusion and stable isotope study.

Cathodoluminescence study

Fluorites often exhibit distinct growth zonation in CL microscope. Central parts of the crystals are green, margins show oscillatory zoning in blue hues. There are very interesting irregular, corroded boundaries between individual growth zones. Calcite

has orange luminescence without growth zones. Younger population (light orange CL) crosscuts the older one (dark orange CL) in form of tiny veinlets.

REE in fluorite

Total content of REE in analyzed fluorites varies between 46 and 273 ppm. REE chondrite-normalized patterns differ at single localities (flat curve without any anomaly and LREE enrichment at Tetčice, a well-balanced curve and a strong positive Eu anomaly at Rakšice). However, both total content and distribution of REE correspond well with those of surrounding rocks. The level of REE fractionation (in the Tb/Ca vs. Tb/La plot) indicate hydrothermal origin of all studied fluorites.

Fluid inclusions

Primary and primary-secondary fluid inclusions have been studied in fluorites. Inclusions are always two-phase (type L+V), with 2-5 vol.% of vapour phase. Homogenization temperatures range between 83 and 165 °C. Inclusions completely freeze at temperatures from -29 to -47 °C. Eutectic temperatures around -20 °C indicate presence of NaCl-H_2O fluid. Last ice crystal melts between 0.0 and -2.6 °C, so the given range for Tm values corresponds to the very low salinity of the trapped solution (between 0 and 4.3 wt.% NaCl eq.). Distribution of the measured data in the Th/salinity plot indicate mixing of more saline and warmer fluid with less saline and cooler one. In fluid inclusion is further probably present small amount of CO_2. Fluid inclusions in associated minerals exhibit, actually, the same fluid characteristics as those in fluorites.

Stable isotopes

Isotopic composition of C and O was determined in calcites from Tetčice. The $\delta^{13}C$ and $\delta^{18}O$ values vary between −6.7/−9.9 ‰ and −7.5/−15.0 ‰ PDB, respectively. Calculated carbon isotopic composition of the parent fluid is around −11 ‰ PDB. Source of carbon was probably in the host rocks, but some admixture of organic carbon cannot be excluded. Calculated $\delta^{18}O$ values of the fluid ranging between 0 and −7.5 ‰ SMOW are typical of meteoric water.

Conclusion

The investigated mineral associations precipitated from low-saline fluids at temperatures of 80–150 °C. These fluids were probably shallow-circulating meteoric waters. Components of mineralizing fluids have been extracted from the host rocks as is documented by REE in fluorites or by carbon isotopes in calcites. The studied fluorite mineralization from the Brno massif could be compared with the Tertiary fluorite mineralization described from the North Bohemia region (Teplice, Jílové u Děčína, Žák et al. 1990).

Reference

ŽÁK K., ČADEK J., DOBEŠ P., ŠMEJKAL V., REICHMANN F., VOKURKA K., SANDSTAT J.S., 1990. Vein barite mineralization of the Bohemian Massif: Sulfur, oxygen and strontium isotopes and fluid inclusion characteristics and their genetic implications. In: POOLE F.G. and DOBEŠ P. (Editors), Proceedings of the symposium on barite and barite deposits, Praha, pp. 35-49.

Accretionary Type Metamorphism in the Meliata Unit (Western Carpathians, Slovakia)

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The blueschist belt of the Meliata unit, formed during the mid-Jurassic (165–170 Ma) high-pressure metamorphism of continental margin and oceanic sequences, occurs south of the Gemericum in east Slovakia. Besides isolated slices overthrusting the basement units to the north, the high-P/T metamorphic rocks are preserved within very low-grade sedimentary sequences, consisting of slates, metasandstones, -siltstones and locally, evaporites. The metasedimentary mélange has been traditionally assumed as an unmetamorphosed series (Meliata series s.s.). The evaporite-bearing formations, which were locally found both in the Slovak and Hungarian territories, played an important role in the structural deformation of the Meliata accretionary wedge.

Recent studies on the Meliata unit have been mostly related to petrology of ophiolites and blueschists (Faryad 1995; Mazzoli and Vozarova 1997; Ivan and Kronome 1995 and references therein and Horváth 2000). By contrast, little attention has been devoted to their mélange matrix (Árkai and Kovács 1986). The present work provides some new results on the very low-grade rocks of the Meliata unit. Sedimentary rocks, some of them mixed also with very fine-grained, altered basic volcanoclastic material, were collected from four localities (Meliata, Držkovce, Rožňavské Bystré and Hačava).

Si contents of white K-micas vary between 3.1 and 3.6, the FM values between 0.05 and 0.55, the total R^{VI} contents between 2 and 2.2 a.p.f.u. The total interlayer charge is predominantly 0.8–0.9 a.p.f.u., the Na/(Na+K) ratio scatters between 0 and 0.1, both parameters being characteristic of very low-grade micas. From the Hačava locality dark marly slate samples contain white micas corresponding to paragonite and phengite with Si content between 3.30–3.35 a.p.f.u. Paragonite was found as core in relatively coarse-grained phengite crystals. Some volcanic rocks, which are in tectonic position with marble, have albite, chlorite and early blueschist facies phyllites, which underwent strong retrogression and mylonitization. They contain relics of chloritoid and pseudomorphs after glaucophane. High-Si phengite is rimmed by medium to low-Si muscovite. In chlorites the di-trioctahedral (sudoitic) substitution plays a subordinate but significant role, in addition to the $FeMg_{-1}$ and Tschermak's substi-