CARBONATE-RICH DYKE IN ROZTOKY INTRUSIVE COMPLEX – AN EVIDENCE FOR CARBONATITE MAGMATISM IN THE EGER RIFT?

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The possible presence of carbonatites in the Eger Rift (NW Bohemian Massif, Czech Republic) has been debated for several decades but no unambiguous evidence has so far been presented. We document an almost 2 m thick dyke of a silicocarbonatite (23 wt. % SiO_2, 27 wt. % CO_2) in the R2 (Roztoky nad Labem) drilling at the depth of 152.9–154.8 m [1]. The silicocarbonatite dyke penetrating carbonatized trachyte and trachytic breccia has two macroscopically distinct facies: (i) a brecciated upper section, and (ii) a macroscopically homogeneous lower section.

The upper section (152.9–154.35 m) consists of angular jig-saw-fitting fragments of a carbonate-rich rock healed by the second generation of a similar (silico-carbonatite) rock. In its lower part (153.9–154.35 m) this facies contains frequent darker bands with abundant aggregates of radially arranged fibre-shaped magnetite, replacing the original pyrite. The set of bands is displaced by frequent subvertical fractures. The brecciated part of the silicocarbonatite dyke also contains frequent late open cracks filled with hydrothermal calcite and dolomite.

The lower facies (154.35–154.8 m) appears macroscopically homogeneous. However, inhomogeneous texture becomes apparent at the thin-section scale. Three different sub-facies were distinguished, based on variations in mineral proportions, geometry and textures: (1) the dolomite-rich (D-type), (2) the silicate-rich (S-type) and (3) the pyrite-rich (P-type). This facies does not contain any open cracks or joints filled with idiomorphic crystals resulting from hydrothermal precipitation, or any heterogenic fragments (alkaline rocks or xenoliths), all of which would indicate explosive, or kinetic brecciation of solidified rock. Among the D-type silico-carbonatite fragments, two different varieties were distinguished (D1 and D2). The D1 variety is silicate-poor (10 vol. % silicates) with accessory pyrite. The silicates (quartz, oligoclase and kaolinized K-feldspar) are skeletally intergrowing with carbonates. The D2 variety is more silicate-rich (30–40 vol. % silicates) and finer grained with intimate intergrowths of silicates (quartz, albite, kaolinized K-feldspar) with carbonates. The carbonates form larger crystals (up to 0.05 mm) compared to silicates (< 0.02 mm). The D-type fragments are enclosed in a network of S-type silicocarbonatite dykelets. The S-type is characterised by larger amounts of silicates (55 vol. %); it is very fine-grained with intimate intergrowths of silicates and carbonates. Locally, isolated, up to 1.5 mm wide dykelets of coarser-grained pyrite-bearing silicocarbonatite (P-type) occur. Idiomorphic phenocrysts of pyrite (5 vol. %; up to 0.15 mm) are enclosed in an aggregate dominated by relatively coarse-grained carbonate with variable amounts of silicates (up to 50 vol. %). The carbonates in all described types consist of mixtures of calcite and Fe-bearing dolomite. The small domains (~20 μm) of dolomite are randomly distributed throughout the prevailing calcite. The shape of such domains is irregular and diffuse, not respecting any crystal structure (oscillatory zoning of growing crystal, immiscibility lamellae, etc.). The textures of D-, S- and P-type silicocarbonatites with intimate intergrowths of silicates and carbonates and dispersed diffused micrometre-scale domains of dolomite in calcite stands in contrast with the structure of idiomorphic carbonate crystals with well-defined growth zones observed in late hydrothermal veins filling the open cracks in the breccia facies.

In the silico-carbonatite, neither alteration fronts, which can be seen in other parts of the drilling (e.g., carbonatized trachytes, carbonatized sandstones), nor any leaching haloes around pyrite, were observed. From the textures, we interpret the rock as magmatic product rather than resulting from alteration processes.

Despite the fact that the silico-carbonatite is associated with alkaline intrusive complex, its content of alkalis is rather low ($Na_2O + K_2O = 2.5$ wt. %), as are REE ($\Sigma REE = 82.6$ ppm). The stable isotope signature ($\delta^{18}O = 7.43‰$, $\delta^{13}C = -2.46‰$) of this rock is distinct from surrounding sedimentary rocks, while it can be compared with C–O isotope systematics of some worldwide carbonatites which probably sourced carbonates from older subduction events. The Sr–Nd isotope composition ($^{87}Sr/^{86}Sr_{30} \sim 0.7062$; $^{143}Nd/^{144}Nd_{30} \sim 0.51205$) points to an enriched mantle reservoir without known counterparts among alkaline rocks from the Eger Rift, perhaps a lithospheric mantle modified through the Variscan subduction. The position of the R2 silicocarbonatite in the Sr–Nd space may indicate a continuum of enriched radiogenic isotope systematics in worldwide carbonatite occurrences.

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References: [1] Rapprich V. et al. (2017) *J Geosci* **62**, 121-136.