PŮVODNÍ PRÁCE/ORIGINAL PAPER

# Slavkovit z Preisselbergu, rudní revír Krupka (Česká republika) a jeho minerální asociace

## Slavkovite from Preisselberg, the Krupka ore district (Czech Republic) and its mineral association

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### Abstract

A unique supergene mineral association was found at abandoned Gallery No. 3 Preisselberg, the Krupka ore district, Krušné hory Mountains, Czech Republic. Slavkovite forms there light pale blue to blue-green rosettes up to 1 mm across composed by lath-like crystals; it is translucent (in aggregates) to transparent (in crystals), very brittle, and has a vitreous luster and perfect cleavage. It is triclinic, space group *P*-1, the unit-cell parameters refined from X-ray powder diffraction data are: *a* 6.414(2), *b* 14.370(3), *c* 16.527(4) Å, *α* 102.81(2), *β* 101.12(2), *γ* 97.94° and *V* 1431.0(8) Å$^3$; its chemical analyses correspond to the empirical formula $(Cu_{12.92}Zn_{0.05}Al_{0.02})_{\Sigma 12.99}[(AsO_4)_{6.01}(PO_4)_{0.01}]_{\Sigma 6.02}(AsO_3OH)_{3.98}\cdot 23H_2O$ on the basis As+P=10 *apfu*. Olivenite was found as relatively abundant dark olive green hemispherical to spherical aggregates up to several mm in size. It is orthorhombic, space group *Pnnm*, the unit-cell parameters refined from X-ray powder diffraction data are: *a* 8.6300(8), *b* 8.2405(8), *c* 5.8384(2) Å and *V* 422.31(5) Å$^3$; its chemical analyses correspond to the empirical formula $(Cu_{2.01}Zn_{0.01}Fe_{0.01})_{\Sigma 2.03}[(AsO_4)_{0.99}(PO_4)_{0.01}]_{\Sigma 1.00}(OH)_{1.06}$ on the basis As+P = 1 *apfu*. Abundant strashimirite occurs there as greenish to white coatings on the area to several cm$^2$, its light green crystalline aggregates up to 0.5 mm in size consisting of acicular crystals are more rare. Strashimirite is probably monoclinic, space group *P*2, the unit-cell parameters refined from X-ray powder diffraction data are: *a* 9.569(6), *b* 18.59(1), *c* 9.032(6) Å, *β* 97.21(6)° and *V* 1594(1) Å$^3$; its chemical analyses correspond to the empirical formula $(Cu_{7.89}Al_{0.07}Zn_{0.05}Ca_{0.03})_{\Sigma 8.04}[(AsO_4)_{3.74}(SO_4)_{0.24}(PO_4)_{0.03}]_{\Sigma 4.00}(OH)_{4.41}\cdot 5H_2O$ on the basis As+P+S = 4 *apfu*. Brochantite forms there abundant dark green fine crystalline coatings on the area up to several cm$^2$ in size and rarely also dark green tiny (up to 0.5 mm) prismatic crystals. It is monoclinic, space group $P2_1/a$, the unit-cell parameters refined from X-ray powder diffraction data are: *a* 13.133(1), *b* 9.855(1), *c* 6.016(1) Å, *β* 103.25(1)° and *V* 757.8(1) Å$^3$; its chemical analyses correspond to the empirical formula $(Cu_{3.91}Al_{0.02})_{\Sigma 3.93}[(SO_4)_{0.97}(AsO_4)_{0.03}]_{\Sigma 1.00}(OH)_{5.85}$ on the basis S+As+P = 1 *apfu*. Devilline was found as relatively abundant whitish fine crystalline coatings on the area up 1 x 1 cm in size; light bluish green aggregates up to 0.5 cm across or rarely also transparent tabular crystals up to 0.2 mm across. Devilline is monoclinic, space group $P2_1/c$, the unit-cell parameters refined from X-ray powder diffraction data are: *a* 20.86(1), *b* 6.195(3), *c* 21.96(1) Å, *β* 102.92(1)° and *V* 2767(3) Å$^3$; its chemical analyses correspond to the empirical formula $Ca_{1.05}(Cu_{4.11}Al_{0.02})_{\Sigma 4.13}(SO_4)_{2.00}(OH)_{6.39}\cdot 3H_2O$ on the basis S = 2 *apfu*. An unnamed Cu-Ca arsenate occurs there as lavendulan-like blue crystalline coatings covering area up to 5 x 5 mm in size or hemispherical aggregates up to 0.5 mm across; its aggregates are composed from very thin (only 1 - 4 μm) tabular crystals up to 80 μm in size. Its X-ray powder data (strongest line 12.51 Å) does not correspond to any known mineral phases. Chemical composition of this mineral phase is possible to be expressed on the basis As+P+S = 4 *apfu* by empirical formulae $Na_{0.03}Ca_{1.03}(Cu_{4.99}Al_{0.03}Zn_{0.01})_{\Sigma 5.03}[(AsO_4)_{3.73}(SO_4)_{0.25}(PO_4)_{0.02}]_{\Sigma 4.00}Cl_{0.43}\cdot nH_2O$ (thin tabular aggregates) or $(Na_{0.03}K_{0.02})_{\Sigma 0.16}Ca_{1.17}(Cu_{4.69}Al_{0.03}Zn_{0.01})_{\Sigma 4.73}[(AsO_4)_{3.73}(SO_4)_{0.25}(PO_4)_{0.02}]_{\Sigma 4.00}Cl_{0.59}\cdot nH_2O$ (tabular aggregates). Further an unnamed Cu arsenate forms there light pale bluish green crystalline aggregates up 1 - 2 mm in size composed by tabular crystals up to 250 μm across in association with slavkovite. It is transparent to translucent, has a vitreous luster and perfect cleavage. Its X-ray powder data (strongest line 9.807 Å) does not correspond to any known mineral phases. This mineral phase is considerably unstable under electron beam of EPMA, the cation/anion ratio determined from WDS is in the range of 1.16 - 1.36. The origin of described mineral association is connected with (sub)recent weathering of primary tennantite in conditions of abandoned mine adit. Origin of Cu-arsenates is possible to express by following sequence: strashimirite → Cu-Ca arsenate → olivenite → slavkovite → Cu-arsenate.

***Key words:*** *slavkovite, olivenite, strashimirite, new mineral phases, powder X-ray diffraction data, unit-cell parameters, chemical composition, the Krupka ore district, Czech Republic.*

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