Chovanite, Pb_{15−2x}Sb_{14+2x}S_{36}O_{x} (x ~ 0.2), a new sulphosalt species from the Low Tatra Mountains, Western Carpathians, Slovakia

Chovanite, a new representative of the group of oxysulphosalts of Pb and Sb was found in three hydrothermal deposits of antimony ore, Dúbrava, Malé Železné, and Klačianka, situated on the northern slopes of the Low Tatra Mountains, Slovakia. It is associated with other Pb–Sb sulphosalts, especially boulangerite, robinsonite and dadsonite. In reflected light, chovanite is white, bireflectance is distinct already in air. Pleochroism is present; colour varies from white with a yellowish green tint (darkest position) to white with a faint bluish tint (lightest position). Reflectance values in air are R_{max} – R_{min} (%) (\lambda nm): 43.6–37.7 (470), 43.0–36.7 (546), 41.3–35.4 (589), 39.2–34.0 (650). Anisotropy is moderate to strong both in air and in oil, with blue grey to brown grey polarization colours. Internal reflections and twinning are absent. The optical properties are very similar to boulangerite. Micro-indentation hardness is 222.5 with a range 213–238. Derived Mohs hardness is 3. Cleavage is good, parallel to the c axis. Simplified chemical formula based on electron-microprobe analyses is Pb_{14.42(35)}Sb_{14.33(11)}S_{36.04(23)}, Z = 4, which corresponds to Pb 50.74, Sb 29.63, S 19.62, total 100.00 wt\%. No other elements exceed detection limits; chlorine is absent and oxygen was not measured. Structural formula is Pb_{15−2x}Sb_{14+2x}S_{36}O_{x} (Z = 4) for which the above mean of microprobe measurement data and the structure refinement give the value of x equal to ~0.2. Density (calc.) is 7.14 g/cm\^{3}. Crystal system is monoclinic, space group C2/m, lattice parameters a = 48.189(48) Å, b = 4.1104(40) Å, c = 34.235(35) Å, \beta = 106.059(15)°, V = 6517(11) Å\^{3}, Z = 4. Chovanite belongs to a sulphosalts family of boxwork structures, together with pellouxite, scaminite, pillaite, marruccite, vurroite, neyite, and several synthetic sulphosalts. Its crystal structure contains 11 independent lead sites, 13 coordination polyhedra of antimony, some of them with Sb sites split into two partially occupied non-overlapping positions, and five mixed Pb, Sb sites. The boxwork structure of chovanite is formed by a combination of three types of structural modules: (a) continuous walls with a complex structure of rod-layer type; these walls are interconnected by (b) rod-like partitions, and the resulting box-like channels (c) are filled by still another type of structure rods. Chovanite has the largest box-like channel system and infill elements known at present. In spite of differences in chemical composition, chovanite is structurally closest to pellouxite (Cu,Ag)_{2}Pb_{21}Sb_{23}S_{55}Cl\{O\} which has a moderately large boxwork channel system.

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