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Suredaite, $PbSnS_3$, a new mineral species, from the Pirquitas Ag-Sn deposit, NW-Argentina: mineralogy and crystal structure

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ABSTRACT

Suredaite, ideally $PbSnS_3$, is a new mineral species from the Pirquitas Ag-Sn deposit (Province Jujuy, NW-Argentina). It was observed in symmetrically banded veins in the Oploca district, and is associated with sphalerite, arsenopyrite, pyrite-marcasite, cassiterite, cylindrite, franckeite, hocartite, rhodostannite, and various Ag-Sb and Ag-Bi sulfosalts in minor amounts. Suredaite occurs in layers up to 1 cm in thickness as aggregates of radially arranged tabular-prismatic (single) crystals, has a metallic lustre, and a dark grey streak. VHN_{50} ranges between 18.2 and 20.6 (mean 19.6) GPa, the Mohs hardness is 2.5–3. It has perfect cleavages parallel to {001}, {101}, and {100}. The measured density varies between 5.54 and 5.88 g/cm^3, D_x was determined to be 5.615 g/cm^3. In reflected plane-polarised light, it is white and is not perceptibly bireflectant or pleochroic. It lacks internal reflections and is weakly anisotropic with metallic blue, mauve to brown rotation tints. Specular reflectance percentages in air and in oil are tabulated from 400 to 700 nm and compared graphically with those for the type specimen of teallite, $PbSnS_2$. Electron microprobe analyses showed suredaite to be chemically inhomogeneous with respect to the compositional variations (in wt%): Pb 42.3–48.5, Ag 0.3–1.1, Fe 0.3–1.0, As 0.2–2.1, Sn 27.7–30.2, S 23.1–24.7. The crystal structure determined from single-crystal X-ray diffraction data revealed orthorhombic symmetry [space group *Pnma*, Z = 4, a = 8.8221(3), b = 3.7728(3), c = 14.0076(3) Å; V = 466.23(4) Å^3]. The atomic arrangement is isostructural to the NH_4CdCl_3 structure type which exists in a series of isotypic sulfides and selenide compounds. The suredaite structure, which is the natural analogue of synthetic $PbSnS_3$, consists of columns of double-edge sharing octahedra running parallel to the *b* axis, which house the Sn atoms. These columns are linked by rods of eightfold-coordinated Pb atoms. On the basis of the structure determination, the empirically determined idealized formula follows a $^{[8]}$(Pb, As,Ag, Sn) $^{[6]}$(Sn,Fe)S_3 stoichiometry. Crystalchemical arguments suggest Ag possibly to occupy interstitial sites according to the alternative formula $^{[4]}$(□,Ag) $^{[8]}$(Pb, As, Sn) $^{[6]}$(Sn,Fe) S_3. The name of this new mineral species is in honor of R.J. Sureda Leston, head of the Department of Mineralogy and Economic Geology, University of Salta, Argentina.