

Menchettiite, $\text{AgPb}_{2.40}\text{Mn}_{1.60}\text{Sb}_3\text{As}_2\text{S}_{12}$, a new sulfosalt belonging to the lillianite series from the Uchucchacua polymetallic deposit, Lima Department, Peru

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ABSTRACT

Menchettiite, ideally $\text{AgPb}_{2.40}\text{Mn}_{1.60}\text{Sb}_3\text{As}_2\text{S}_{12}$, is a new mineral from the Uchucchacua polymetallic deposit, Oyon district, Catajambo, Lima Department, Peru. It occurs as black, anhedral to subhedral grains up to 200 μm across, closely associated with orpiment, tennantite/tetrahedrite, other unnamed minerals of the system Pb-Ag-Sb-Mn-As-S, and calcite. Menchettiite is opaque with a metallic luster and possesses a black streak. It is brittle, with uneven fracture; the Vickers microhardness (VHN_{100}) is 128 kg/mm^2 (range 119–136) (corresponding to a Mohs hardness of $2\frac{1}{2}$ –3). The calculated density is 5.146 g/cm^3 (on the basis of the empirical formula). In plane-polarized incident light, menchettiite is weakly to moderately bireflectant and weakly pleochroic from dark gray to a dark green. Internal reflections are absent. Between crossed polarizers, the mineral is anisotropic, without characteristic rotation tints. Reflectance percentages (R_{\min} and R_{\max}) for the four standard COM wavelengths are 33.1, 39.8 (471.1 nm), 31.8, 38.0 (548.3 nm), 30.9, 37.3 (586.6 nm), and 29.0, 35.8 (652.3 nm), respectively.

Menchettiite is monoclinic, space group $P2_1/n$, with unit-cell parameters: $a = 19.233(2)$, $b = 12.633(3)$, $c = 8.476(2)$ Å, $\beta = 90.08(2)^\circ$, $V = 2059.4(8)$ Å³, $a : b : c = 1.522 : 1 : 0.671$, $Z = 2$, and it is twinned on $\{100\}$. The crystal structure was refined to $R = 0.0903$ for 2365 reflections with $F_o > 4\sigma(F_o)$ and it resulted to be topologically identical to those of ramdohrite, uchucchacuaite, and fizélyite. The six strongest X-ray powder-diffraction lines [d in Å (I/I_0) (hkl)] are: 3.4066 (39) ($\bar{3}12$), 3.4025 (39) (312), 3.2853 (100) (520), 2.8535 (50) ($\bar{2}32$), 2.8519 (47) (232), and 2.1190 (33) (004). Electron-microprobe analyses gave the chemical formula $\text{Ag}_{1.95}\text{Cu}_{0.01}\text{Pb}_{4.81}\text{Mn}_{3.20}\text{Fe}_{0.02}\text{Zn}_{0.01}\text{Sb}_{6.09}\text{As}_{3.94}\text{Bi}_{0.01}\text{S}_{23.95}\text{Se}_{0.01}$, on the basis of 44 atoms and according to the structure refinement results. Menchettiite can be classified among the Sb-rich members of the lillianite homeotypic series, which are described with the general formula $\text{Ag}_x\text{Pb}_{3-2x}\text{Sb}_{2+x}\text{S}_6$. Besides the heterovalent substitution $2\text{Pb}^{2+} \rightarrow \text{Ag}^+ + \text{Sb}^{3+}$ taken into consideration by the above formula, two isovalent substitutions relate menchettiite to the other lillianite homeotypes, i.e., $\text{Mn}^{2+} \rightarrow \text{Pb}^{2+}$ and $\text{As}^{3+} \rightarrow \text{Sb}^{3+}$. The name is after Silvio Menchetti (1937–), Professor of Mineralogy and Crystallography at the University of Florence. The new mineral and mineral name have been approved by the Commission on New Minerals, Nomenclature and Classification, IMA (2011-009).

Keywords: Menchettiite; new mineral; electron microprobe data; reflectance data; X-ray diffraction data; ramdohrite; lillianite; Uchucchacua deposit, Peru