

Zhonghongite, $\text{Cu}_{29}(\text{As,Sb})_{12}\text{S}_{33}$, a new mineral from the high-sulfidation vein of Jiama porphyry system, Tibet, China

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ABSTRACT

Zhonghongite (IMA2023-046), ideally $\text{Cu}_{29}(\text{As,Sb})_{12}\text{S}_{33}$, is a new mineral discovered in the high-sulfidation vein of the Jiama deposit (E 91°45', N 29°42'), southern Tibet, China. It forms complex intergrowths with watanabeite and tennantite-tetrahedrite, creating veined or massive aggregates ranging from millimeters to centimeters. Single crystals of zhonghongite are anhedral, and their sizes range from several micrometers to ~100 μm . The mineral is gray with a black streak and metallic luster. It is brittle, with uneven fractures, and has a calculated density of 4.925 g/cm^3 . The average values of electron microprobe analyses (wt%) are: Cu 42.19, As 11.11, Sb 16.09, S 25.45, Hg 3.73, Mn 0.67, and Te 0.28. The empirical formula, based on 33 sulfur apfu, is $(\text{Cu}_{27.60}\text{Hg}_{0.77}\text{Mn}_{0.51}\text{Fe}_{0.07}\text{Ag}_{0.02})_{\Sigma 28.97}(\text{As}_{6.16}\text{Sb}_{5.49}\text{Te}_{0.09})_{\Sigma 11.74}\text{S}_{33}$. In zhonghongite, the substitution of Sb for As is limited, with the atomic ratio of As/(As+Sb) ranging from 0.457 to 0.629. Hg, Mn, and Fe, with minor Cu, are divalent and serve for charge balance. Zhonghongite is orthorhombic, space group $F2mm$ (42), $a = 10.37741(5)$ Å, $b = 14.69821(9)$ Å, $c = 36.7645(2)$ Å, and $V = 5607.66(5)$ Å³. The crystal structure was solved and refined by single-crystal X-ray diffraction with a final $R1 = 0.0235$ for 27 028 (2467 unique) reflections. It is composed of individual AsS_3 tripiramids and clustered As_4S_7 tripiramids, CuS_4 tetrahedra, and CuS_3 planar triangles, connected through corner S atoms in tetrahedral coordination and octahedral coordination with Cu and/or As. The structure is a derivative of a tetrahedrite-type structure. Zhonghongite was formed under high-temperature conditions and is classified as an intermediate-sulfidation state mineral.

Keywords: New mineral, Zhonghongite, $\text{Cu}_{29}(\text{As,Sb})_{12}\text{S}_{33}$, Jiama deposit