

Tetrahedrite-(Ni), Cu₆(Cu₄Ni₂)Sb₄S₁₃, the first nickel member of tetrahedrite group mineral from Luobusa chromite deposits, Tibet, China

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ABSTRACT

Tetrahedrite-(Ni) (IMA2021-031), ideally Cu₆(Cu₄Ni₂)Sb₄S₁₃, is the first natural Ni-member of tetrahedrite group mineral found in Luobusa chromite deposit, Tibet, China. The new species occurs as anhedral grains 2 to 20 μm in size, associated with gersdorffite, vaesite, and chalcostibite, which are disseminated in a matrix of dolomite, magnesite, quartz, Cr-rich mica, and Cr-bearing clinocllore. Tetrahedrite-(Ni) is black in color with a reddish-black streak and metallic luster. It is brittle with uneven fractures and has a calculated density of 5.073 g·cm⁻³. The mean values of 9 electron microprobe analyses (wt%) are Cu 39.83, Ni 5.67, Fe 1.45, Sb 21.69, As 5.45, S 25.39, total 99.48, and the empirical formula calculated on the basis of cation = 16 apfu is $^{M(2)}\text{Cu}_{6.00}^{M(1)}[\text{Cu}_{4.03}(\text{Ni}_{1.55}\text{Fe}_{0.42})_{\Sigma 1.97}]_{\Sigma 6.00}^{X(3)}(\text{Sb}_{2.85}\text{As}_{1.16})_{\Sigma 4.01}\text{S}_{12.67}$. Tetrahedrite-(Ni) is cubic, with space group $I\bar{4}3m$, $a = 10.3478(4)$ Å, $V = 1108.00(14)$ Å³, and $Z = 2$. Its crystal structure has been solved by X-ray single-crystal diffraction on the basis of 188 independent reflections, with a final $R_1 = 0.0327$. Tetrahedrite-(Ni) is isostructural with tetrahedrite group minerals. It represents the first natural tetrahedrite-group mineral with a Ni-dominated charge-compensating constituent. Tetrahedrite-(Ni) may be the product of late-serpentinization at moderately high-temperature conditions around 350 °C. In this case, tetrahedrite-(Ni) and its mineral paragenesis record an entire geological process of nickel enrichment, migration, activation, precipitation, and alteration from deep mantle to shallow crust.

Keywords: Tetrahedrite-(Ni), new mineral, tetrahedrite group, crystal structure, serpentinization, listvenite, Luobusa chromitite