

New minerals auropolybasite [Ag₁₅AuSb₂S₁₁] and auropearceite [Ag₁₅AuAs₂S₁₁]: Implications for the formation of bonanza ores in epithermal systems

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ABSTRACT

The new minerals auropolybasite, ideally Ag₁₅AuSb₂S₁₁, and auropearceite, ideally Ag₁₅AuAs₂S₁₁, were found at the Šibeničný vrch near Nová Baňa in Slovakia. They were found as anhedral grains up to 0.2 mm in size, usually rimmed by acanthite. Both new minerals are associated with acanthite, argentopolybasite, argentopearceite, pyrargyrite, proustite, stephanite, selenostephanite, rozhdestvenskayaite-(Zn), zvěstovite-(Zn), zvěstovite-(Fe), naumannite, Au-Ag alloys, uytendbogaardite, iodargyrite, and bromargyrite. They are dark grey to black, opaque, with a black streak and metallic luster. The Mohs hardness is ~3. They are brittle with no observable cleavage and with a conchoidal fracture. The calculated densities are 6.622 g/cm³ for auropolybasite and 6.606 g/cm³ for auropearceite. In reflected light, auropolybasite and auropearceite are gray with a bluish tint, no observable bireflectance, and very weak pleochroism. They show moderate anisotropy in crossed polars with weak greenish and green-blue tints. The reflectance values for wavelengths recommended by the Commission on Ore Mineralogy of the IMA are (R_{min}/R_{max}, %): 33.5/31.6 (470 nm), 32.9/31.1 (546 nm), 32.1/30.6 (589 nm), and 30.2/29.3 (650 nm) for auropolybasite and 30.6/29.8 (470 nm), 30.3/29.2 (546 nm), 29.7/28.7 (589 nm), and 28.1/27.4 (650 nm) for auropearceite. The empirical formula (based on 29 apfu) for auropolybasite is Ag_{15.27}Au_{0.84}(Sb_{1.51}As_{0.46})Σ_{1.97}(S_{10.55}Se_{0.30}Cl_{0.06})Σ_{10.91} and that for auropearceite is Ag_{15.84}Au_{0.88}(As_{1.33}Sb_{0.44})Σ_{1.76}(S_{10.46}Se_{0.05}Te_{0.01})Σ_{10.52}. The ideal end-member formulas are Ag₁₅AuSb₂S₁₁ for auropolybasite and Ag₁₅AuAs₂S₁₁ for auropearceite. Their symmetry is trigonal, space group *P*321. Lattice parameters for auropolybasite are: *a* = 15.1091(5) Å, *c* = 12.1518(5) Å, *V* = 2402.42(15) Å³, *Z* = 4, and those for auropearceite are: *a* = 14.995(3) Å, *c* = 12.115(2) Å, *V* = 2359.3(8) Å³, *Z* = 4. Crystal-structure analysis of auropolybasite confirmed that its atomic arrangement is isotypic to that of the other members of the polybasite group and it is isostructural with auropearceite. These minerals formed in the waning stages of epithermal systems, where reduced, S-rich, low-salinity fluids transported Au, Ag, Sb, and As as thiocomplexes. These fluids were unable to transport Cu, Pb, and Zn, thus explaining the chemical composition of these minerals and the entire mineral assemblage.

Keywords: Auropolybasite, auropearceite, polybasite group, new mineral, crystal structure, chemical composition, epithermal mineralization, Nová Baňa, Slovakia