

## **Metallic gold from the Suurikuusikko Mine (Kittilä, Finland): Geochemistry and metallogenetic implications**

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At the Suurikuusikko Mine, gold mineralization is related to a tectonic lineament and can be classified as orogenic/shear-zone type. Most gold is known to occur either as submicronic inclusions or as atoms trapped in the lattice of arsenopyrite and pyrite, while metallic gold is a minor type (ca. 4% of total Au). Several ore samples from the Suurikuusikko Mine have been investigated with the optical and electron microscope, while mineral composition was measured using energy-dispersive spectroscopy and wavelength-dispersive spectroscopy. The mineralization is dominated by pyrite and arsenopyrite, followed by gudmundite (FeSbS). Pyrite is arsenian (0.2-4% As), anhedral to euhedral, occurs as grains that can be larger than 200 µm across and include arsenopyrite, chalcopyrite or galena. Most arsenopyrite is euhedral, acicular (ca. 10-20 µm across) and inclusion-free. Coarser (>100 µm), subeuhedral arsenopyrite occurs in zones of fractured rock, where sulfides are fragmented ± recrystallized. Ni minerals have been found in two samples, occurring as tiny grains (< 20 µm in size), some with ullmannite composition (NiSbS) but other ones showing compositions that correspond to the formula Ni<sub>2</sub>Sb<sub>2</sub>S.

Metallic gold has been found mostly as inclusions in the pyrite (± associated with galena inclusions) and arsenopyrite from the fractured rock, sometimes filling the cracks of the fragmented sulfides. Gold grains not associated directly with sulfides were found in carbonate veinlets. Metallic gold is allied with Ag and Hg (27-68 wt% Au; 28-53 wt% Ag and 1.5-19 wt% Hg).

The investigated samples provided indications of a relative Sb enrichment of the mineralizing solutions. The common occurrence of metallic Au in association with relatively large ± recrystallized arsenopyrite grains or with carbonate veinlets, suggests metallic Au precipitation in a distinct metallogenetic stage that probably postdated the main Au-bearing mineralization.

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