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# Crítical and noble metals in major sulphides from Mavres Petres, Greece



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#### Mavres Petres

The Au-rich, carbonate-hosted polymetallic deposit at Mavres Petres is located in the Kassandra Mining District in northern Greece (Fig. 1). Measured and indicated resources at this mine are 0.63 Mt @ 9.3% Zn, 8.0% Pb, 205 g/t Ag and considerable contents of Au (www.eldoradogold.com). The critical metal (e.g. In and Sb) potential is of possible future relevance.



### X-MINE

X-MINE is a Horizon 2020 project funded by the European Commission. The aim of the project is to develop tailor-made methods to streamline exploration and to reduce handling of waste rock. Overall, the project is expected to contribute to reduced environmental impact from transport, ore processing and chemical handling in the recovery of base and precious metals as well as result in lowering the costs per produced amount of metal.

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## Trace elements in common sulphides

3D XRT-XRF scans and whole rock data show that the ore at Mavres Petres is locally enriched in As, Sb, Sn, Cd, Cu and In, in addition to Au and Ag. SEM and in situ LA-ICP-MS data reinforce and highlight that Au is hosted by arsenopyrite and As-enriched pyrite. Both phases exhibit compositional zoning. Sphalerite is variably In-enriched, ranging from c. 10 ppm to 125 ppm within the same crystal. Silver is hosted by e.g. galena and tetrahedritetennantite group minerals.



Figure 1. A) Geological map of the Kassandra Mining District, northern Greece. B) 3D image of the surface geology showing the location of Mavres Petres at the Stratoni fault zone. Yellow "towers" are drill sites.

### Arsenopyríte





Laser ablation inductively coupled mass spectrometry analysis (LA-ICP-MS)

Py Sph LApit

Pyrite



### Sphaleríte





LA-depth profiling

LA- depth profiling

LA-depth profiling

Back scattered electron (BSE) image of compositionally zoned arsenopyrite. LA-ICP-MS analyses show that the zoning is related to variable concentrations of Sb, Pb Cu and Au and that the latter is essentially lattice-bound. BSE-image of compositionally zoned Asenriched pyrite with higher As contents in the rim. LA-ICP-MS data show that the pyrite is also high in Cu, Pb and Au.

Highlights

BSE-image of a sphalerite with four LA-pits. The In content varies between 10 and 125 ppm and is coupled with variations in Cu. Gallium concentrations are c. 70 ppm.

- High Au contents are systematically associated with increased As in pyrite or arsenopyrite, but As-rich minerals are not necessarily Au-rich.
- LA-ICP-MS analyses indicate that Au is essentially lattice-bound, and not occurring as discrete inclusions.
- Sphalerite is locally In-enriched, with up to 125 ppm In.
- Additional metals of potential relevance in the ore are Sn and Sb and to some degree Ga, of which the latter two are considered as critical.
- On-going work suggests that As enrichment (+Au?) increases with the time-evolution of the mineralised system.