

The Fettelite from Chañarcillo (Copiapó, Chile)

April 2019

The silver ore deposit of Chañarcillo was an historical silver mining site in Chile, which produced more than 3000 tons of silver since beginning of operations in 1832 until mid-20th century. Chañarcillo is renowned for its high silver grades and the occurrence of extraordinary mineral specimens. For example, here were recovered an specimen of native silver weighing 90 kg and extraordinary proustite crystals and silver halides are recorded in the literature.



Proustite from Chañarcillo (Chile). FOV 1.5 cm.

Geologically, the Chañarcillo deposit is a Ag-Co-Ni-As vein deposit of Cretaceous age, hosted by mesozoic limestones. The origin of the deposit is interpreted as a distal manifestation of iron oxide-copper-gold deposits or the nearby porphyry copper

deposits. The veins are composed mainly of calcite, barite, and subordinate siderite and quartz. At depth, where the veins cut the limestones, the gangue minerals are accompanied by arsenopyrite, Co-Ni-Fe sulfarsenides (cobaltite, gersdorffite, glaucodot) and arsenides (safflorite, skutterudite, niccolite, löllingite), sphalerite, freibergite, silver sulfarsenides (pearceite, proustite) and sulfantimonides (polybasite, pyrargyrite), and native arsenic. The deposit have an oxidized zone, with abundant silver halides (chlorargyrite, bromargyrite, embolite, iodargyrite) plus native silver, acanthite, and limonite. Nowadays, all high grade ore was extracted and the mine dumps reprocessed, so the recuperation of specimens in the mining district is unlikely.

One interesting feature of the Chañarcillo mineralogy is the presence of mercury, which forms moschellandsbergite and cinnabar. Also, mercury is present in the very rare mineral **fettelite** ($\text{Ag}_{24}\text{HgAs}_5\text{S}_{20}$). This mineral was found in Chañarcillo samples of proustite and it was its second occurrence, after the type locality (Glasberg quarry, Nieder-Beerbach, Odenwald, Germany). Also, the fettelite from Chañarcillo forms the best crystallizations of the mineral, in size and quality for the species. Fettelite occurs associated with proustite, forming dark red to bright red mica-like flakes and hexagonal plates, in drusy associations on proustite or dispersed in clay overlying the proustite druses.



Fettelite flakes on proustite. Chañarcillo (Chile). FOV 0.6 cm.

Recently, we had the opportunity to study an old specimen from Chañarcillo, probably collected during 19th or early 20th century. The specimen reunites the classic features of the locality, with the limestone matrix, alteration clay with dispersed fettelite flakes and good and abundant proustite crystals.



A hand sample of Chañarcillo high grade silver ore

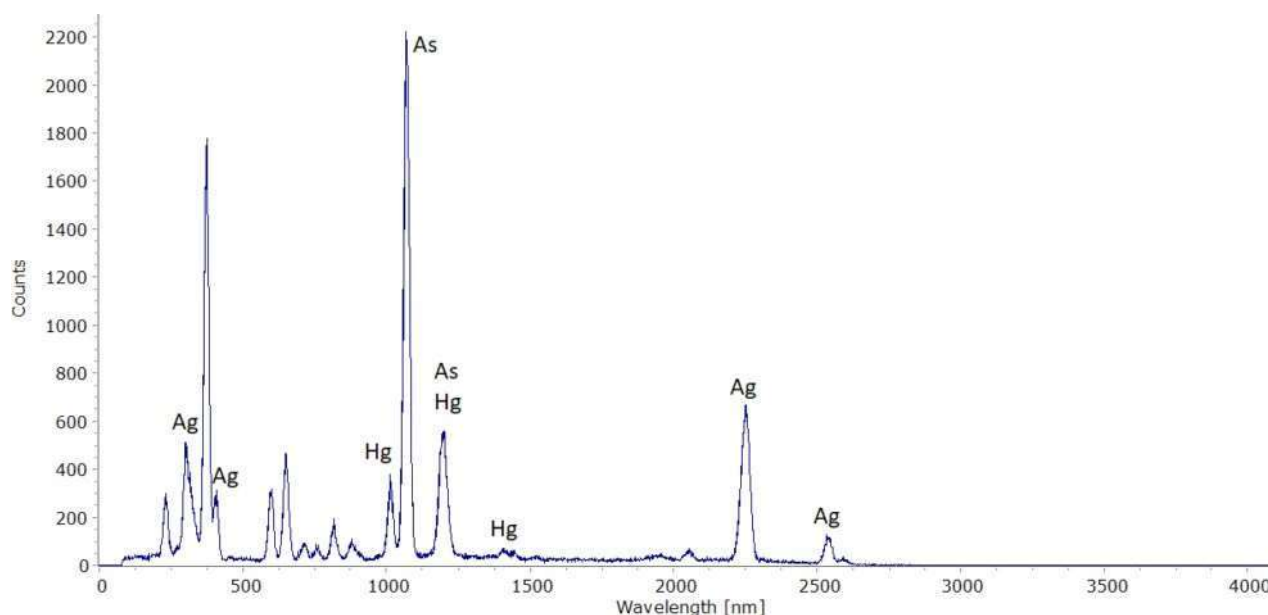
containing

proustite and fettelite.

The analysis of fettelite by both X-ray spectroscopies confirmed the

Raman and energy dispersive

species.



Elemental analysis of the fettelite flakes adjusted to maximize the energies around 10 KeV, showing the characteristic peaks of mercury.



micaceous fettelite filled with clay



Fettelite with proustite

This specimen constitutes, for both the species and the deposit of origin, as well as its characteristics, an extraordinary piece for those interested in the silver and

460



Proustite and fettelite. Chañarcillo.

References

Bindi, L., Keutsch, F. N., Francis, C. A., & Menchetti, S. (2009). Fettelite, $[\text{Ag}_6\text{As}_2\text{S}_7][\text{Ag}_{10}\text{HgAs}_2\text{S}_8]$ from Chañarcillo, Chile: Crystal structure, pseudosymmetry, twinning, and revised chemical formula. *American Mineralogist*, 94(4), 609–615. <https://doi.org/10.2138/am.2009.3096>

Sillitoe, R. H. (2007). Hypogene reinterpretation of supergene silver enrichment at Chañarcillo, Northern Chile. *Economic Geology*, 102(5), 777–781.