

Mineralogy and mode of occurrence of gold in the San Gabriel deposit (SE Peru)

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The San Gabriel mine project (100% SAA Buenaventura) is among the most promising mining targets in terms of potential for gold production during the next years in Peru. It is located in the Ichuña district (Moquegua, Peru). This gold and base metal mineralization appears in the peruvian high plateau (4,800 m a.s.l.) in an area constituted by folded sedimentary sequences of Mesozoic age, on which some volcanic and sub-volcanic bodies have been emplaced during the Miocene. Weathered igneous acidic rocks (from andesites to rhyolites) host an important hydrothermal-type mineralization with special interest for its gold contents.

The project is currently in the feasibility studies phase: within this context, some samples of mineral concentrates have been studied in order to determine textural and geochemical characteristics that could exert influence on the mineral processing and metallurgical operations. Primary metallic mineralization is constituted by pyrite, arsenopyrite, monazite and, in a lesser extent, chalcopyrite, sphalerite and galena. Pyrite is the dominant sulphide (50-120 µm size) and is often in a moderate to advanced state of oxidation. The rest of the sulphides appears in smaller sizes (10-60 µm). Selected crystals of pyrite, arsenopyrite and chalcopyrite were analyzed for gold and other trace elements by electron probe microanalysis. All of them have shown to be gold carriers (see table 1), especially arsenopyrite, which has, on the other hand, native Bi micro-inclusions. Assuming a solid-solution mechanism for gold occurrence in pyrite, the expression proposed by Deditius et al. (2014), indicates a formation temperature of about 220°C.

In addition to the above, it must be pointed out that native gold has also been detected, in the form of small mineral inclusions (~1 µm, see figure 2) in quartz grains. This native gold is not releasable by grinding, so the ore can therefore be considered as refractory.

References

Deditius, A.P., Reich, M., Kesler, S.E., Utsunomiya, S., et al., 2014. The coupled geochemistry of Au and As in pyrite from hydrothermal ore deposits. *Geochimica et Cosmochimica Acta*, 140: 644-677.

Table 1. Gold contents (mg/kg) in the primary sulphides and secondary Fe oxides.

Figure 1. Native gold particles (micro-inclusions in quartz

crystals).

	Pyrite (n=66)	Arsenopyrite (n=17)	Chalcopyrite (n=6)	Fe oxides (N=78)
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	45.50	0.00
257.12	913.71	460.83	201.09	
499.00	549.50	565.00	355.25	
1423.00	5224.00	1479.00	1009.00	

