MINERALIZATION AND PARAGENESIS OF THE HUANZALA MINE, CENTRAL PERU—A DISCUSSION

PIERRE SOLER,

ROLANDO CARRASCAL, AND JORGE SAEZ
Departamento de Geología, Universidad Nacional de Ingeniería, Avenida Tupac Amaru Km. 4, Lima, Peru

Sir: In a recent paper Imai et al. (1985) presented mineralogical and petrological data on the Huanzala polymetallic ore deposit, central Peru. This paper is an important step in the understanding of physical and chemical conditions of ore formation in Huanzala, but the genetic interpretation they propose is not very convincing because macroscopic and microscopic relations between the ore assemblages and wall rock (e.g., Cretaceous sedimentary formations and Miocene calc-alkaline granodioritic dikes) are not considered in detail.

Furthermore, the ore presents a general macroscopic and microscopic concordance with the strata and shows peculiar structures and textures, such as a pyrite geopetal texture, frambooidal pyrite, a ribbon structure of pyrite and sphalerite and/or galena, micro-synsedimentary or syndiagenetic faults, and convolutions involving ore minerals.

A detailed study of ore distribution, in manto V3 lenses (Carrascal, 1984) shows that in each lens the zonation is generally concentric with a higher Zn content toward the rims and a higher Pb content toward the center of the lenses. In addition, Carrascal (1984) notes a migration of manto V3 lenses to the northwest (accompanied by a weak increase of Zn and Pb contents and a weak decrease of Cu content) when ascending in the stratigraphic sequence. No vertical zonation of Zn, Pb, and Cu contents appears. Finally, on a larger scale, the distribution of mineral assemblages shows a stratigraphic evolution (Carrascal, 1984), from black, Fe-poor, chalcopyrite-rich sphalerite which dominates in mantos V1 and V2, to red, Fe-rich, chalcopyrite-poor, sphalerite which dominates in mantos V4 and V5. All these observations make very probable a synsedimentary and/or syndiagenetic deposition of the greater part of the mineralization.

The ore and gangue mineralogy, as described by Carrascal et al. (1983), Tsučiya et al. (1983), Carrascal (1984), and in even more detail by Imai et al. (1985) implies introduction of elements by hydrothermal solutions at high temperatures (approximately 300°C). The only source of the introduced elements, according to the Andean geologic context and the pretenconic and probably syndiagenetic character of ore formation at Huanzala, has to be volcanogenic. In fact, the existence of volcanic activity contemporaneous with sedimentation is proved by the presence of tuffaceous limestones and some tufis interbedded in the upper Santa Formation. Moreover, Huanchala is not an isolated case and the Santa Formation has been recognized as an important metallocot of the central and northern Peruvian Andes (Samaniego, 1981), with numerous, probably volcanogenic, strata-bound ore deposits of proximal (El Extrano) or more distal character (Malaquito, Pueblo Libre, Pacornllamac, Pachapaqui). ORSTOM Fonds Documentaire

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MINERALIZATION AND PARAGENESIS OF THE HUANZALA MINE, CENTRAL PERU—A REPLY

HIDEKI IMAI

Central Research Laboratory, Mitsui Mining and Smelting Company, Ltd., Harachi, Ageo City, Saitama Prefecture, Japan 362

Sir: In the Huanzala mining area, the mineralized zone extends 6 to 8 km in the limestone of the Santa Formation; it has a width of 150 to 200 m. The orebodies occur as lenslike forms parallel to the hanging walls and footwalls of the formation.

Soler says that mantos V1 through V5 always exist in the same stratigraphic levels in the Santa and the overlying Carhuaz Formation. This statement is not adequate in the strictest sense. For convenience sake at the mine, the orebodies are divided into five layers, nevertheless they are distributed sporadically in the Santa Formation, as shown here in Figure 1 and in figure 3 of my paper (Imai et al., 1985).

Some zinc and lead ores in this deposit are closely associated with skarn minerals, such as garnet, diopside, vesuvianite, epidote, etc. (Fig. 2 A, B, and C).

From this observation, I classify the deposit as pyrometasomatic, or contact metasomatic. Also, the paragenesis of the sulfide minerals in the deposit resembles that of Cerro de Pasco. The deposit at Cerro de Pasco is generally recognized to have a hydrothermal replacement origin.

I emphasized these points in the discussion of the genesis of the Huanzala deposit and it continues to be my basic viewpoint. I find this deposit to be the same as Morococha in Peru (Petersen, 1965), Kamioka in Japan (Imai, 1978a), and Sondang in Korea (John, 1963, 1978), and to be similar to Cerro de Pasco in Peru (Petersen, 1965; Einaudi, 1977).

Sheetlike dikes, of Miocene-age quartz porphyry occur in the Santa Formation. Granodiorite porphyry is found in the Chimu Formation (figs. 1 and 2, Imai.