

Mineral chemistry as a tool for optimization the mineral processing in the Central Andean Tin Belt

A. JIMÉNEZ-FRANCO¹, A. PAYÀ¹, P. ALFONSO¹, M. GARCIA-VALLÉS

¹Dpt. d'Enginyeria Minera, Industrial i Tic, Universitat Politècnica de Catalunya, Av de les Bases de Manresa 08242 Manresa, Spain (abigail@emrn.upc.edu; annapaya92@gmail.com; pura@emrn.upc.edu)

²Dpt. Cristal·lografia, Mineralogia i Dipòsits Minerals, Universitat de Barcelona, Carrer Martí i Franquès s/n, 08028 Barcelona, Spain, (maitegarciavalles@ub.edu)

The Central Andean tin belt is a metallogenic province, well-known by Sn, Ag, Pb, Zn, and W. However, in the Bolivian sector there is potential for strategic elements, mainly Indium, but still uncertain. In the present study, we characterized several deposits from the Poopó, Oruro, and Santa Fe mine districts. This work is focused in determining the mineralogy and metal richness in these deposits to evaluate their real extractive potential.

Electron microprobe analysis were performed in order to characterize the chemical composition of minerals. Ore mineral assemblage is represented by oxides, sulfides and sulfosalts. Cassiterite constitutes the earliest mineralization. Subsequently, several generations of galena, sphalerite ± pyrite, chalcopyrite, arsenopyrite and chalcocite occurred. Sn is also present in sulfides as several members of stannite group, such as stannoidite, hocartite, kēsterite, petrukite, sakuraiite, pirquitasite and stannite.

An important bunch of sulfosalts rich in Sn, Pb, Ag, Cu, Sb and Bi, such as franckeite, potosiite, berndtite, teallite, tetrahedrite, freibergite, tennantite, gustavite, andorite, ourayite, miargyrite, cylindrite, boulangerite, jamesonite, zinckenite, viaeneite, bismuthinite and bismite also occur in high amounts. Usually, they appear in crystals of small grain size, of few μm.

During processing Zn, Pb and Ag are recovered from most of the phases where they are present. However, Sn recovery is only effective from cassiterite and, when Sn-bearing minerals are in sulfide form, ore concentration is not successful. The extreme case occurs in the Poopó mine, where Sn is not exploited although the geochemical characterization reveals high amounts of Sn, thus it is mainly found as stannite-group minerals. Element concentrations in Poopó samples also show high content in Ag, Zn, Sb and As. Geochemical characterization necessary for to establish an adequate processing flux diagram to optimize the mining activity.