RENE-2: Sistemas de Pórfidos de Cu (±Mo±Au) e IOCG: de la petrogénesis a la exploración

Geology and geochemistry of the Yerbas Buenas Mine: a new iron oxide apatite ore deposit?

Diego Rojas[1], Karl Riveros-Jensen[1].
(1) Departamento de Geología, Facultad de Ingeniería, Universidad de Atacama, Copiapó, Chile

In northern Chile the most important IOA deposits are located in an iron belt genetically associated with dioritic magma bodies along the Atacama Fault System (e.g. Oyarzun et al., 2003). The Yerbas Buenas mine is located 30 km N of La Serena, Chile, near important IOA-IOCG deposits. In this contribution a geological and geochemical framework has been defined for the Yerbas Buenas deposit, in order to establish its similarities with the recognized IOA deposits at the Chilean Iron Belt.

The main lithology in the Yerbas Buenas mine is related to microdioritic bodies, which are affected by the NS-NE Romeral Fault System and covered by eolian/alluvial sands and gravels. Three alteration-mineralization stages can be defined. The earliest stage is related to biotitization of the microdioritic rocks and moderate magnetite precipitation (5-20 vol%). The second stage correspond to actinolite-apatite which is associated with NE striking magnetite-rich veins (20-60 vol%). The latest stage is related to mushketovite-actinolite-chlorite which introduce scarce sulfides such as chalcopyrite and pyrite.

XRF analyses using a S1 TITAN handheld, indicate that samples are dominated by Fe_2O_3 [69.8-3.4%], SiO_2 [65-5.3%], Al_2O_3 [22.5-1.1%] and CaO [20.4-0.8%]. Lower concentrations of P_2O_5 [17.9%-740 ppm], MgO [8.6-0%], TiO_2 [1.4-0%] and K_2O [1.2%-400 ppm] were also detected. The main trace elements are Cl [1%-410 ppm], Co [1940-20 ppm] Ce [1290-20 ppm] and V [520-110 ppm], which display detectable concentrations in all samples.

The lowest Fe_2O_3/TiO_2 ratios were recorded in the microdioritic host rocks, which can represents the occurrence of Ti-rich mineralogical phases that could be originated during the magmatic crystallization. However very high Fe_2O_3/TiO_2 ratios were measured in massive veins, which can be associated with Fe-rich hydrothermal magnetite. The wide range of V concentration in samples, could also supports the occurrence of both magmatic and hydrothermal Fe-Ti oxides (e.g. Broughm et al., 2017). Occurrence of CaO, P_2O_5 and Cl reveal that clorapatite is an important alteration mineral, probably formed from Cl bearing hydrothermal fluids with minor contribution of meteoric waters (e.g. Edfelt et al., 2005). Concentration of Co and Ce suggest a more detailed geochemical study to define the economic potential of these elements. Mineralogical and geochemical evidence indicate that the Yerbas Buenas deposit can be genetically clasiffied as an IOA ore deposit.