Magmatic sulphide saturation as an indicator of fertility in the Río Blanco Cu-Porphyry Deposit, central Chile

Y. CAJAL* AND I. H. CAMPBELL

Research School of Earth Sciences, Australian National University, 142 Mills Road, Acton, ACT, 2601, Australia (*correspondence: yamila.cajal@anu.edu.au)

Recent studies [e.g. 1,2] show that the Platinum Group Elements can provide new insights into granitic magma fertility by determining the onset of sulphide saturation relative to volatile exsolution. However, there are not previous studies on the role that sulphide saturation plays on copper-gold magma fertility in the Andes of central Chile, where the world's biggest copper reserves are formed.

This study evaluates the role that the timing of magmatic sulphide saturation plays in copper-gold fertility in this region through the study of igneous rocks associated with the world's biggest copper deposit, the Rio Blanco Cu-Porphyry [3]. The samples include different lithologies from the San Francisco Batholith and the porphyritic intrusions related to the mineralization. They have been analysed for major elements using XRF, trace elements by LA-ICP-MS, and Re, Au and PGE by the Ni-sulphide fire assay, isotope dilution method.

Preliminary results suggest that sulphide saturation occurred ca. 2.2-1.8 wt.% MgO, slightly before than volatile saturation at ~1.2 wt.% MgO. This is similar to El Abra Cu-Porphyry Deposit [1]. It is suggested that the amount of sulphide separated from the melt was small, enough to lower the PGE and Au contents, but not enough to have a significant effect on Cu due to its lower partition coefficient, resulting in a Cu-dominated deposit.

We will also report the results of duplicate PGE analysis and analysis of hydrothermal veins in order to evaluate the possible effect of PGE nuggets and hydrothermal alteration, respectively. The results of oxygen isotope analysis, Ce^{4+}/Ce^{3+} ratios (as a measure of melt fO_2), and U-Pb ages will be also reported and compared with the results from other porphyry Cu and Cu-Au deposits from Northern Chile and elsewhere.

[1] Cocker et al. (2015) J. Pet. **56**, 2491-2514. [2] Park et al. (2016) Geochim Cosmochim Acta **174**, 236–246. [3] Mudd and Jowitt (2018) Econ Geol **113**,1235-1267.