

## **Copper-gold fertility: insights from PGE geochemistry of the Penacho Blanco and Polo Sur deposits, Northern Chile.**

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The Centinela District, northern Chile, is host of several 39 to 45 Ma mineralized porphyries, including both Cu-only and Cu-Au deposits. This study focusses on Polo Sur and Penacho Blanco porphyry Cu-Mo deposits with the objective to assess the fertility of Cu and Au in magmas that are related to their formation, using platinum group elements (PGE) geochemistry.

PGE are sensitive indicators of sulphide saturation due to their high partition coefficient into sulphide melts and low mobility in hydrothermal fluids[1,2]. If a parent magma reaches an early sulphide saturation, an immiscible sulphide melt will extract chalcophile metals (e.g. Cu and Au) and prevent them from entering the volatile ore-forming fluid. In contrast, if the sulphide saturation occurs close to the time of volatile saturation, most of the metals will be available to enter the fluid phase to form a porphyry deposit.

Thirty samples from Polo Sur and Penacho Blanco were analysed for major and trace elements. A subset was selected and analysed for their PGE concentration by Ni-sulphide extraction, isotopic dilution method[3].

Results for major and PGE geochemistry data indicate that the MgO content varies from 0.6 to 3.5 wt. % and that Pt and Pd vary from 0.01 to 1.85 and 0.04 to 3.27 ppb, respectively, similar to those observed in the El Abra porphyry Cu deposit[4]. Zircon U-Pb ages, trace elements (including Ce<sup>3+</sup>/Ce<sup>4+</sup>) and oxygen isotopes will be reported as indicators of the melt conditions (*f*O<sub>2</sub>, temperature) and compared to other porphyry deposits. Although the samples span from dioritic to rhyodacitic in composition, it is not possible to establish the onset of the sulphide saturation for Penacho Blanco and Polo Sur. However, the geochemistry still reflects the nature of the processes involved and they can be classified as porphyry Cu-only deposits on the chalcophile element fertility diagram[5].

[1] Park *et al.* (2016) *Geochim. Cosmochim. Acta* **174**, 236–46. [2] Mungall & Brenan (2014) *Geochim. Cosmochim. Acta* **125**, 265–89. [3] Park *et al.* (2012) *Geochim. Cosmochim. Acta* **93**, 63–76. [4] Cocker *et al.* (2015) *J. Petrol.* **56**, 2491–2514. [5] Park *et al.* (2018) *Miner. Depos.* <https://doi.org/10.1007/s00126-018-0834-0>