Re-Os isotopes in Andean IOCGs and IOA deposits: Implications for the source of metals

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The Re-Os isotopic system has been extensively used to determine the age and source of metals in a variety of mineral deposits.

Published Re-Os data for Chilean IOCG and IOA deposits indicated a radiogenic signature (initial Os ratio of 0.36±0.10) for the large Candelaria IOCG [1], suggesting a mixture between mantle and crustal components for the source of the hydrothermal ores. Additionally, limited Re-Os data on IOA show much higher calculated initial Os ratios (1.2 to 8.4) which were interpreted as Os derived from leaching of sedimentary rocks [1]. This is in contrast with recent work on Los Colorados IOA in northern Chile [2] that favors a magmatic-hydrothermal origin for the magnetite ore.

Here we provide new Re and Os data on magnetite and sulfides from selected IOCGs and IOA from northern Chile in order to evaluate the source of Os and by inference the source of metals in these deposits. The Re and Os data could be used to discriminate between the magmatic and hydrothermal model for Andean IOA and IOCG. Our preliminary Re results combined with previously published data indicates that magnetite in IOA deposits incorporates low amounts of Re during its crystallization, usually <1 ppb, whereas magnetite in IOCG deposits show slightly higher contents (0.3-6 ppb) [1]. Chalcopyrite from IOCG deposits show similar low Re values, whereas pyrite can reach a few tens of ppb. The relatively low Re content in magnetite and chalcopyrite could imply a low metal contribution from crustal sources, suggesting that metals in these deposits are predominantly sourced from the magmas.

[1] Mathur et al. (2002) Age of Mineralization of the Candelaria Fe Oxide Cu-Au Deposit and the Origin of the Chilean Iron Belt, Based on Re-Os Isotopes. *Econ Geol* **97**, 59-71 [2]Simon et al. (2014) Iron and oxygen isotope and element systematics of magnetite from the Los Colorados IOA deposit, Chile: A paradigm shift for IOA deposits? SEG-Keystone, Colorado.