Re-Os isotope systematics: sources and age of epithermal and porphyry copper ore deposits

O.CARDON[1] L.REISBERG[2] A.S.ANDRE-MAYER[1] J.LEROY[1] AND V.MILU[3]

[1] Henri Poincaré University, Nancy 1, UMR CNRS 7566 G2R; olivier.cardon@g2r.uhp-nancy.fr; anne-sylvie.andre@ g2r.uhp-nancy.fr; jacques.leroy@g2r.uhp-nancy.fr

[2] UPR CNRS 2300 CRPG; reisberg@crpg.cnrs-nancy.fr

[3] Geological Institute of Romania; vmilu@igr.ro

Pophyry copper and low-sulfidation epithermal deposits are often spacially associated, but the genetic link between them remains unclear. The Re-Os system can be used to address this question, as it constrains both the source of the metals and the age of the mineralization

The Apuseni Mountains (West Romania) enclose many andesitic intrusions, often associated with porphyry copper and/or epithermal ore deposits. This study focuses on the Bolcana area where porphyry copper (Bolcana, Cu +/-Au) is spacially associated with several low-sulfidation epithermal deposits (Troita, Pb-Zn; Magura, Au). Analyzed sulfides included pyrite, galena, and sphalerite.

A strong difference in Re concentration is observed between the porphyry and the epithermal ore deposits.:

- Pyrites of the Bolcana porphyry have high Re (up to 870 ppb) but low non-radiogenic Os (<0.02 ppb) concentrations, leading to $^{187}Os/^{188}Os$ ratios of ~ 50 to 100. ^{187}Re-^{187}Os ages of about 10 Ma are obtained, in agreement with the estimated deposit age.

- The low-sulfidation epithermal deposit of Troita is very poor in Os (< 0.003 ppb) but also in Re (≤ 1 ppb). The $^{187}Os/^{188}Os$ ratio is generally much less than 1, but one sample has a ratio of 2.7 (age corrected to 10 Ma). The Re/Os ratios of the epithermal samples are too low to allow reliable age information to be obtained.

For the porphyry samples, the correction for radiogenic Os is too large to permit characterization of the non-radiogenic component. For the epithermal samples, the generally low Os isotopic ratios suggest a mantle origin. This conclusion is tentative, given the very small quantities of Os analyzed (always < 1 pg relative to a total blank of ~ 0.2 pg). We are currently developing techniques to allow analysis of larger samples, which will improve the sample/blank ratio. Nevertheless, blank contamination cannot explain the initial ratio of 2.7 obtained for one epithermal sample. Instead, this may reflect derivation of Os from the porphyry sulfides after a short period (several 10s to 100s of thousand years) of radiogenic ingrowth. This could occur either during a distinct remobilization event or by continuous long-lasting liquid-vapor fractionation processes.