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C.R. HARRIS[1], T. PETTKE[2], C.A. HEINRICH[1] AND T. KLEINE[1]

[1]IGMR, ETH Zurich, Clausiusstrasse 25, 8092 Zurich, Switzerland (harris@erdw.ethz.ch; heinrich@erdw.ethz.ch; kleine@erdw.ethz.ch)

[2]Institute of Geological Sciences, 3012 Bern, Switzerland (pettke@geo.unibe.ch)

We have analyzed Pb isotopic ratios of natural fluid and melt inclusions by LA-MC-ICPMS and demonstrate the ability to use Pb ratios normalized to both ^{204}Pb and ^{206}Pb in tracing ore mineralization. The case study follows extensive feasability tests (Pettke *et al*., in prep) using synthetic Pb fluid inclusions, in which we attained within run precisions (± 2SE) of as good as 200 ppm (normalized to ^{206}Pb) and 400 ppm (normalized to ^{204}Pb) and shot to shot reproducibilities (± 2SD) of 800 ppm and 7000 ppm, respectively.

Fluid inclusions in this study are from quartz veins in two different Cu-Au porphyry systems in the Apuseni Mountains, Romania. The Apuseni Mountains represent the richest concentration of metal deposits in Europe, and have been mined since pre-Roman times. Mineralization is hosted by sub-volcanic Miocene magmas intruded in a transtensional geodynamic environment. The magmatic rocks are mostly andesitic in composition, several of which contain high Sr and Pb concentrations, LILE enrichment and MORB-like Sr and Nd isotopic compositions characteristic of adakite-like magmas. Stocks hosting the porphyry deposits have adakite-like chemical signatures. Whole rock major, trace, and Pb-Sr-Nd isotopic analyses on the magmatic rocks represent the maximum range in age and composition, including endmembers of hybrid magmas recognized in the field from mingling textures. Pb isotopic ratios of whole rock solutions were measured with MC-ICPMS using Tl normalization. Fluid inclusions were measured by LA-MC-ICPMS while admixing desolvated 997-Tl standard solution. In high temperature stockwork veins, fluid inclusion ratios are indistinguishable from high temperature sulfides but less radiogenic than galena from the same deposit. Pb ratios of fluids and sulfides overlap ratios from the magmatic host rocks. Feldspar cores and several melt inclusions hosted in the feldspar cores, however, exhibit Pb isotopes more radiogenic than the magmatic rocks and fluids, consistent with observed inverse feldspar zoning. Results will be explored in consideration of the idea that ore deposition is linked to a pulse of more primitive magma into the system (e.g., Kamenov *et al*., 2005).

References

Kamenov, G., Perfit, M., Jonasson, I., and Mueller, P., 2005, Chemical Geology, v. 219, p. 131-148.

Pettke, T., Audetat, A., Oberli, F., Wiechert, U., Harris, C. R., and Heinrich, C.A., in preparation.