

Magmatic-Hydrothermal Cu - Au Mineralization: Geological Observations and Fluid-Chemical Data from Porphyry-Style and Epithermal Deposits in Northwestern Argentina

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Large but well-confined calkalkaline centres on the eastern side of the main Andean Cordillera are well suited for investigating some of the basic processes leading to porphyry-style and associated epithermal ore deposits of diverse types. The unusually high Au/Cu ratio of these systems, compared to the Cu deposits in the main porphyry belt of Chile, is also of particular economic interest. This paper will review recent research on the regional tectonics, the geology, the igneous geochemistry and the fluid evolution in selected ore deposits associated with the Farrallon Negro and La Famatina centres in NW Argentina. In conjunction with observations from magmatic-hydrothermal systems elsewhere, fundamental insights have been gained by application of novel microanalytical techniques, notably LA-ICPMS analysis of ore-metal concentrations in single fluid and melt inclusions. These data provide an exciting first glimpse at the likely magmatic source control of hypersaline brines upon the Au/Cu ratio of porphyry-style deposits. They also define the mechanism of Cu precipitation, as the main factor controlling the final hypogene grade of porphyry orebodies, and suggest a key role for brine/vapor separation and metal partitioning in the selective transfer of Cu, As and Au from the porphyry domain to the regime of epithermal vein deposits.