The genesis of Climax-type porphyry Mo deposits: Insights from fluid and melt inclusions

ANDREAS AUDÉTAT[1]

[1]Bayerisches Geoinstitut, Universität Bayreuth, Germany andreas.audetat@uni-bayreuth.de

Based on geological evidence it has been proposed that the ore-forming melts and fluids of Climax-type porphyry Mo deposits contained up to weight percent levels of Mo. However, melt inclusions analyzed from Pine Grove contain only a few μg/g Mo [1]. Based on the latter observation, [2] proposed that Climax-type deposits formed by circulation of large volumes of evolved, volatile-rich melts through the underlying porphyry stocks.

The aim of this presentation is to review fluid and melt inclusion data that have been gained since the pioneering work on Pine Grove. Data on Mo concentrations in silicate melts and/or magmatic fluids are now available from Questa (NM), Climax (CO), Henderson (CO), Mt. Emmons (CO), Cave Peak (TX), and Anticlimax (AK). At four locations, intermediate-density fluid inclusions representative of a supercritical, single-phase fluid prior to vapor-brine separation have been documented, all showing salinities of 6-20 wt% $NaCl_{equiv}$ and Mo concentrations $\leq$100 μg/g. Ore-related silicate melts typically contained 5-20 μg/g Mo, although the ones at Pine Grove contained only 2-3 μg/g Mo, and some extremely evolved residual melts at Climax contained up to 100 μg/g Mo. Overall, these results strongly support the model of [2], i.e., metal extraction from large volumes of relatively Mo-poor melts and fluids.

A key question with regard to the mineralization potential thus is: What factors promote segregation of residual melts into the apical parts of plutons/batholiths and the formation of apophyses? Based on the close genetic link between porphyry Mo-forming magmas, topaz rhyolites and A-type granites it is proposed that high degrees of melt fractionation and efficient melt segregation are ultimately caused by the relatively dry nature and low production rate of within-plate silicic magmas, with fluorine potentially driving a runaway effect once it reaches concentrations at the weight percent level.

[1] Lowenstern (1994), *Geology* **22**, 893-896. [2] Shinohara, Kazahaya & Lowenstern (1995), *Geology* **23**, 1091-1094.