113-14 Copper Partitioning between Aqueous Fluid and Granitic Composition Melt at High Pressure and Temperature Conditions

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Presenting Author:

Emerson Long

Authors:

Long, Emerson[1], Thomas, Jay[2]

(1) Syracuse University, Syracuse, New York, USA, (2) Syracuse University, Syracuse, New York, USA

Abstract:

Copper production is becoming increasingly important with the electrification of society due to its extensive use in technologically advanced materials. Copper deposits are often associated with granitic rocks and fluids exsolved from granite melts. Both the melt and fluid can host, transport, and deposit copper. Extensive work has been done analyzing copper partitioning between fluid and melt at upper crustal conditions to constrain depositional P-T conditions. However, copper-bearing melts likely originated at much greater depths before being transported up through the crust to the final depositional environments. We investigated copper partitioning between fluid and melt at 5 to 10 kbar and 600 to 900°C, which are conditions relevant to lower continental crustal magmatic source regions. Experiments were conducted in piston-cylinder devices using a natural granitic starting material and water, and oxygen content was controlled using a double-capsule method to fix oxygen fugacity at the fayalite-magnetite-quartz buffer. Either copper chloride or copper oxide were added to experiments, also allowing us to study the effect of

chlorine on fluid chemistry and copper partitioning. Fractured quartz was used to trap fluid inclusions to study the chemistry of the fluid using microthermometry, and we measured the copper in the quenched melt (glass) using electron probe microanalysis. Future work will use laser ablation inductively coupled plasma mass spectrometry (LA-ICPMS) to directly measure the copper concentrations in the fluid inclusions.