An experimental study on the effect of Na/K of the silicate melt on partitioning behavior of Cu and Au in magmatic - hydrothermal systems

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porphyry-type deposits are one of major resources of Cu and Au. It has been proposed that metals in those deposits are derived from magma. The essential feature of the magmatic-hydrothermal model is the separation of mental-rich aqueous fluid from silicate melt. Experimental studies on the partitioning of Cu and Au between granitic melt and aqueous fluids have demonstrated the importance of complexing agents, such as chloride and sulfur, in the transport of Cu and Au. However, no systematic experimental data are available concerning the role of melt composition in magmatic-hydrothermal process.

The present study was conducted to evaluate the effect of melt composition on the partitioning behavior of Cu and Au. We investigated experimentally the fluid/melt partitioning of Cu and Au in the systems synthetic haplogranite gel -H_2O-HCl at 1kbar, 850 ºC with Ni-NiO buffer by using rapid-quench cold seal bombs. Preliminary Experimental data show that the partition coefficient of copper $D_{Cu}^{fluid/melt}$ linearly increases with increasing HCl concentration. That agrees with results of other researchers, who interpreted this behavior as the result of the formation of CuCl complexes in the fluids. $D_{Cu}^{fluid/melt}$ show a strong melt compositon dependence, increasing from 1.35 to 22.18 with the molar Na/K of melt varying from 0.58 to 2.56, while $D_{Au}^{fluid/melt}$ do not show any correlation with the molar Na/K varying from 0.64 to 3.38. The data presented here suggest Cu and Au have different complexation mechanisms in melt, so their partitioning behaviors between aqueous fluids and silicate melt have different responses to the change of molar Na/K of silicate melt.