The connection betwen high K melts and Au deposits: Evidence from natural and experimental systems.

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It has long been suspected that K-enriched melts are efficient carriers of Au. This assumption is the result of clear spatial/temporal associations between Au deposits and High-K (or shoshonitic) intrusives in the deposits of Lihir Island [1], Bajo de la Alumbrera, Argentina [2], Quesnilla, BC, Canada [3] and in the Lower Yangtze rerion of China [4] and others. However, no direct link has been made between the high K nature of these melts and their Au endowment.

As a test of this hypothesis, we analysed Au by LA-ICPMS in clinopyroxene-hosted melt inclusions from an ore-associated dyke at the Masbate Gold Deposit in the Phillipines. Pyroxenes were re-equilibrated at 1100°C for 24 hours in a controlled gas mixing furnace, quenched in water and polished to expose glassy, homogenised ultrapotassic (8 - 11 wt% K_2O) inclusions. All inclusions analysed contain high levels of dissolved gold (up to 20ppm Au).

To independently test this empirical link, we equilibrated hydrous rhyolitic glasses of variable K contents (plus either FeS or FeS and NaCl) with Au capsules in internally-heated pressure vessels. At constant water content, temperature, pressure, fO_2 (controlled by H –Ar mixtures) the addition of K_2O increases Au solubility by nearly an order of magnitude. In runs with FeS only, Au content increased from 0.08 ppm Au (@1.6% K_2O) to 0.66 pm Au (@ 6.8%K_2O), while those with FeS and NaCl contained 0.45 ppm @ 1.6% K_2O and 2.2 ppm Au @ 6.1%K_2O. These analyses and experiments do not explain the mechanism for increased Au solubility, but they do strengthen the link. Furthermore, in terranes where pervasive alterration obscures primary igneous compositions, melt inclusions may provide the best information, and may provide a valuable exploration tool.

References

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