Are Re concentrations in porphyry copper deposits the result of hydrothermal fluid-country rock interactions? Evidence from stable isotope analyses (δ^{34}S, δ^{18}O, δD) of the Muratdere Au-Cu (Mo-Re) porphyry deposit, Turkey

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The Muratdere deposit is a Cu-Au (Mo-Re) porphyry system in western Turkey. The porphyry contains several generations of quartz veins and intrudes an ophiolitic melange. The earliest mineralised vein set, V2, comprises quartz-pyrite-chalcopyrite and hosts the majority of the Cu-Au mineralisation, with a δ^{34}S of +1.1‰ to +6.3‰. The remainder of the Cu-Au mineralization, and some of the Mo mineralization, is associated with disseminated chalcopyrite and molybdenite in the host porphyry, with a δ^{34}S of –2.2‰ to +4.6‰. Veinset V3, is composed of quartz and dendritic molybdenite with Re mineralization. LA-ICP-MS analysis of disseminated and vein molybdenite show comparable Mo concentrations, but molybdenite within the V3 veins has significantly higher concentrations of Re. This suggests that fluids forming the V3 veins evolved in a contrasting manner to those which precipitated the disseminated molybdenite. Given the heavier isotopic signature of the V3 veins (+5.6‰ to +8.8‰) interaction with peridotite lenses in the surrounding melange, (δ^{34}S of between +6.8‰ and +8.8‰ [1]), may be an important factor in the Re enrichment. Veinset, V5, is polymetallic, with elevated values of Ag, Au and Te, with δ^{34}S values between –5.5‰ and +2.7‰, suggesting assimilation of sedimentary sulphur. A working hypothesis is that hydrothermal fluid-country rock interactions provides an enrichment mechanism for Re & Te in this deposit. New δD and δ^{18}O results and fluid inclusion analyses will constrain this hypothesis.

[1] Koptagel *et al* (1998), *Int. Geol. Rev.* **40**, 363-374