Genesis of the Takatori tungsten-quartz vein deposit, Japan

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The Takatori hypothermal tungsten-quartz deposit is located about 100 km NNE of Tokyo, Japan. The deposit is composed of wolframite-bearing quartz veins with minor amounts of cassiterite, chalcopyrite, pyrite and muscovite. The deposit is hosted by Mesozoic sedimentary rocks of chert, sandstone and mudstone. A K-Ar age of 69 Ma for vein muscovite was reported [1].

SEM-EDS mapping images of the rim of wolframites showed replacement textures. The Mn/Fe ratio in wolframite was measured by EPMA because the replacement texture could be distinguished by the Mn/Fe ratio in wolfranlites. The ratio in the center of wolfranlites was around 40 mole%, but the ratio increased up to 70 mole% at the rim of some crystals coexisting with pyrite. Based on a consideration using phase diagrams, the textures were assumed to form by replacement of iron in the wolframite with manganese in a later stage lower-temperature fluid.

Oxygen isotope ratios were measured on minerals from the deposit to determine if the ore-forming fluids were derived from related igneous bodies. The oxygen isotopic equilibrium temperatures of mineral pairs from the veins were around 400°C. The isotopic equilibrium temperatures for quartz-muscovite, quartz-wolframite and quartz-cassiterite pairs were discussed. Oxygen isotopic compositions of the Takatori ore-forming fluids were then calculated to infer the fluid source.

The discrepancy between the homogenization temperatures of fluid inclusions in vein quartz and the oxygen isotopic equilibrium temperatures was considerably large, which might correspond to the "pressure correction" to the homogenization temperatures. If it is the case, the formation pressure for the Takatori deposit is calculated on the basis of the difference between the pressure-independent isotopic equilibrium temperatures and pressure-dependent homogenization temperatures of fluid inclusions. The ore-formation depth is calculated to be around 5 km. These lines of evidence suggest that a granitic magma beneath the deposit played a crucial role in the formation of the Takatori deposit.

[1] Shibata & Ishihara (1974) *Econ. Geol.* **69**, 1207-1214.