Evolution of the hydrothermal fluid at the Takatori deposit, Japan - Replacement texture at the rim of wolframite

*Junya Ikuma[1], Yuichi Morishita[1]

1.Graduate School of Integrated Science and Technology, Shizuoka University

The Takatori deposit is a vein type tungsten deposit in Japan. The tungsten-bearing mineral is wolframite ((Fe, Mn)WO_4), which has a complete solid solution of iron and manganese. Although previous papers pointed out that the replacement texture at the rim of wolframite was formed by a later fluid, the nature of the later fluid was not clear. The purpose of this study is to reveal the characteristics of the later hydrothermal fluid at the Takatori deposit.
Samples were obtained from the No.7 vein at -4 Level (60m above sea level) and -7 Level (30m below sea level). They are called the middle and lower samples, respectively in this study.
SEM-EDS mapping images of the rim of wolframites showed replace textures. Since the replacement texture can be distinguished by the Mn/Fe ratio in wolframites, the Mn/Fe ratio was measured by EPMA. In the middle samples, the ratio in the center of wolframites was between 40 and 50 mole%, but the ratio increased up to 70 mole% at the rim of some crystals with pyrite.
These replacement textures were assumed to form by replacement of iron in the wolframite with manganese in the later fluid that came into the hydrothermal system after the wolframite formation. The later fluid flowed around wolframite crystals and made replacement texture in the middle samples.
In the lower samples, SEM-EDS mapping images and the change of Mn/Fe ratio showed oscillatory and complicated textures with pyrite and other sulfide minerals. These are also recognized as replacement textures that were formed by the later fluid since the trend of the change of Mn/Fe ratio is the same as that in the middle samples. The textures were formed by the later fluid which flowed thought cracks in wolframite.
Based on the relationship between pH and oxygen fugacity in phase diagrams, the temperature of the later fluid that made replacement textures was lower than that of the fluid, which had precipitated wolframites. The replacement of iron with manganese was occurred because ferberite ($FeWO_4$) was unstable and hubnerite ($MnWO_4$) with pyrite was stable.

Keywords: Takatori deposit, wolframite, replacement texture, hydrothermal deposit

