

The formation of Yichun Ta-Nb deposit, China through fractional crystallization of magma as indicated by the fluid and melt inclusions

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The Yichun Ta-Nb deposit located in Jiangxi Province, China can be divided into four belts, and they are, from the lower to the upper part, two-mica granite belt, muscovite granite belt, albite granite belt, and lepidolite-albite granite belt [1, 2]. To understand the ore-forming processes of Yichun deposit, we studied the fluid and melt inclusions of this deposit. The quartz from the mineralized granite contains mainly H₂O-NaCl inclusions and silicate melt inclusions. The homogenization temperatures of the H₂O-NaCl inclusions range from 180 to 220°C, with the densities of 0.86~0.94 g/cm³, and salinities of 0.9~6.6 wt%NaCl equivalent. Raman spectroscopic analyses of the daughter minerals in the melt inclusions showed that, from the lower to the upper mineralization belts, the albite content increased, while the muscovite content decreased gradually until it was replaced by lepidolite with the appearance of manganotantalite in the lepidolite-albite belt. Also, the densities of melt inclusions, estimated from their contents of daughter minerals, showed a decreasing trend. The homogenization experiments of melt inclusions were performed under elevated external pressure by using the hydrothermal diamond anvil-cell; the total homogenization temperatures ranged from 710 to 860°C, and the initial melting temperatures of solid phases ranged from 570 to 760°C; both of them showed a decreasing trend from the lower to the upper mineralization belts. These features illustrate that the mineralization belts were formed through a continuous fractional crystallization of magma, with the gradual enrichments of volatile components and incompatible elements, including Ta, Nb, Li, Rb, and Cs, in the residual granitic magma. The late hydrothermal fluid exsolved from the granitic magma led to greisenization at the top parts of Yanshan granite body.

[1] Lin (1996) *Geological Publishing House* (in Chinese). [2] Li, Zhu, Rao & Jin (2004) *Science in China Ser. D*, **47**: 639-650.