Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

SRD043-03 会場:201A 時間:5 月 22 日 09:30-09:45

花崗岩質マグマ活動と金属鉱床形成の関係-中部日本、苗木花崗岩体の例- Relationship between granitic magmatism and formation of hydrothermal ore deposits: An example from Naegi granitic body

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Late Cretaceous to Paleogene granitoids located in the Inner zone of Southwest Japan are classified into three belts: the Sanin-Shirakawa belt, the Sanyo-Naegi belt and the Ryoke belt (Ishihara, 1971). W-Sn-Cu mineralizations are characteristically associated with the granitoids of the Sanyo-Naegi belt. Although numerous geochemical studies have been made for the hydrothermal ore deposits accompanied with these granitoids, the entire process from the granitic magma crystallization to the formation of hydrothermal ore deposits is still in debates.

The Naegi granitic body in the eastern part of the Sanyo-Naegi belt and related ore mineralizations have been investigated in this study to clarify detailed chemical characteristics of ore forming fluids for a future discussion of the process.

The Naegi granite intrudes into the felsic ignimbrites called the Nohi rhyorite. A high Rb/Sr ratio and an REE pattern with a distinct negative Eu anomaly were reported from the granite (Ishihara et al., 2001), implying its origin as a highly fractionated magma. The granitic body is associated with numerous hydrothermal ore deposits, from center of the body to the surroundings: (1) U-Th-REE-bearing pegmatites, (2) W-Sn-Bi-Be deposits, (3) W-As-Bi deposits, and (4) Cu-Pb-Zn-As deposits. Compositions and the physicochemical conditions of ore fluids have been estimated from detailed petrographic studies, EPMA analyses of minerals and LA-ICP-MS microanalyses of fluid inclusions for 14 elements (Na, K, Mn, Fe, Cu, Zn, Rb, Mo, Sn, Sb, Cs, W, Pb and Bi). Temporal relations of fluid inclusions trapped in quartz and topaz crystals were investigated by microscopic observations. Characteristics of the deposits are as follows:

(1) U-Th-REE-bearing granitic pegmatites are consisted of quartz, feldspar, biotite, muscovite and trace amounts of REE minerals. Fluid inclusions show homogenization temperatures of 200-470C with salinities ranging 1-7wt%. Base metal (Cu, Pb, Zn) concentrations in fluid inclusions are 2-3 times higher than those of W, Sn and Bi concentration, while Sb concentrations are relatively stable.

(2) W-Sn-Bi-Be deposits are of wolframite-cassiterite-native bismuth-topaz-beryl-quartz veins in the granite and the ignimbrites. Fluid inclusions show homogenization temperatures of 250-430C with salinities ranging 1-33wt%. Base metal concentrations are higher than those of W, Sn and Bi.

(3)W-As-Bi deposits are of wolframite-loellingite-arsenopyrite-native bismuth-quartz veins in the ignimbrites with silicification. Fluid inclusions show homogenization temperatures of 185-360C with salinities ranging 1-7wt%. Base metal concentrations are higher than those of W, Sn and Bi.

(4)Cu-Pb-Zn-As deposits are of sulfide (Cu-Fe-As-Zn-S) -chlorite-quartz veins in the ignimbrites. Fluid inclusions show homogenization temperatures of 150-360C with salinities ranging 1-6wt%. Almost all the metal concentrations, especially Cu, Pb, Zn, Fe, W and Mo, of fluid inclusions in (4) are 2-3 times higher than those of the other deposits.

Although the above physicochemical characteristics of the ore forming fluids have been clarified in the present study, much detailed examinations are required to investigate the entire process of ore formations and geneses and evolutions of the fluids.

キーワード: LA-ICP-MS, 流体包有物, 苗木花崗岩, レアメタル, ベースメタル, 熱水性鉱床
Keywords: LA-ICP-MS, fluid inclusion, Naegi Granite, rare metal, base metal, hydrothermal ore deposit