東南極セールロンダーネ山地ベストハウゲンに産する鉄に富むグラニュライトに見られる部分溶融に関連した変成組織とザクロ石希土類元素パターン

馬場壮太郎[1]、小山内康人[2]、足立達朗[2]、外田智千[3]、中野伸彦[2]、豊島剛志[5]
[1] *琉球大学教育学部*
[2] *九州大学比較社会文化研究院*
[3] *国立極地研究所*
[4] *新潟大学理学部*

Metamorphic textures and garnet REE derived from anatexis of Fe-rich granulite in Vesthaugen, Sør Rondane Mountains, East Antarctica

Sotaro Baba[1], Yasuhito Osanai[2], Tatsuro Adachi[2], Tomokazu Hokada[3], Nakano Nobuhiko[2], and Takeshi Toyoshima[4]
[1]*University of the Ryukyus*
[2] *Kyushu University*
[3]*National Institute of Polar Research*
[4] *Niigata University*

Vesthaugen (23˚32' - 23˚35' E, 71˚42' - 71˚39'), an isolated small exposure on the glaciated plain of Utsteinflya in the Sør Røndane Mountains, is an approximately 5.0 km in length North -South and 1.0 km in wide East to West. The exposure is chiefly composed of diorite, quartz-diorite, biotite-hornblende gneiss, and hornblende gneiss. In some gneisses accompanied garnet grains, and thin layers of garnet-sillimanite-biotite gneiss and pyroxene-granulite are intercalated (Shiraishi et al., 1997). Osanai et al. (2013) have proposed the new tectonic framework and evolutional history of metamorphic basement in the SRM. According to their results, high-grade basement rocks in SRM can be divided into two different terranes. NE-terrane is underlain by amphibolite to granulite facies metamorphic rocks, and SW-terrane by granulite to green schist-facies rocks. These two terranes have preserved different metamorphic P-T paths, clockwise for NE-terrane and counter-clockwise for SW terrane, and different age clusters of detrital zircon U-Pb ages. Vesthaugen is considered to belong to the NE-terrane in new terrane divisions based on the presence of cordierite-bearing lithology. However, detailed metamorphic process has not been estimated. In this paper we introduce metamorphic textures, mineral compositions and garnet REE abundance of cordierite-bearing Fe-rich granulites (spinel-garnet-orthopyroxene and spinel-garnet-sillimanite granulites), and discuss these metamorphic textures were formed in relate to the peritectic reactions and back reactions.

Fe-rich granulites consist mainly of cordierite, spinel, garnet, K-feldspar, and plagioclase. Sillimanite and orthopyroxene are also associated, but they do not appear in the same thin section. Garnet occur as porphyroblast, corona, and as ideomorphic (or fully-faced) grains. Large amount of spinel occurs as aggregate associated with cordierite and plagioclase coronas. Relatively large spinel grains contains micro inclusions of diaspor [AlO(OH)], corundum, quartz and biotite. Two types of the appearance of alkali-feldspar are recognized, dusty reddish colored one containing fine rutile needles, perthite blebs and lamella, and the other one is clear without significant exsolution lamella. Cordierite occurs as inclusions both with subhedral shape and rounded grains within K-feldspar. Ideomorphic shaped garnet is present within the rounded cordierite. Orthopyroxenes were replaced by fine biotite and quartz symplectite. The equilibrium P–T conditions of 900 – 950˚C and 6 ± 1 kbar for the peak of metamorphism were obtained using experimentally calibrated geothermobarometers based on the systems Grt–Opx and Grt–Opx–Pl–Qtz. The condition is consistent with the stability field of chemical composition of ternary feldspar. The obtained high temperature condition is sufficient to form a partial melt. For orthophroxene-bearing sample, secondary garnet corona, euhedral garnet, cordierite inclusions within K-feldspar presumably formed via peritectic- and back-reactions of Opx + Spl + Melt + (Qtz) = Grt^{2nd} (as euhedral)+ Kfs + Crd and Spl + Melt = Grt^{2nd} (as corona around spinel). These secondary garnets have different REE abundance and patterns, and are differ from those of the garnet porphyroblast. Garnet corona may inherit low REE abundance of spinel. Euhedral garnet REE pattern is similar with those of garnet porphyroblast, but some grains enriched in HREE with increase from Gd to Lu. The REE pattern resemble to that of garnet in the granulite-grade (Bea, 1996), and in the aplite and the pegmatite (Samadi et al., 2014). They presumably crystallized from partial melt together with cordierite and K-feldspar.

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