Proc. NIPR Symp. Antarct. Geosci., 7, 183, 1994

AN EXPERIMENTAL STUDY OF A CORDIERITE-BEARING GRANULITE FROM RUNDVÅGSHETTA, LÜTZOW-HOLM BAY, EAST ANTARCTICA (ABSTRACT)

Toshisuke KAWASAKI[1]*, Masahiro ISHIKAWA[2] and Yoichi MOTOYOSHI[3]

[1]*Institute of Earth and Planetary Sciences, Faculty of Education, Kochi University, Kochi 780*
[2]*Institute of Geology and Paleontology, Faculty of Science, Tohoku University, Sendai 980-77*
[3]*National Institute of Polar Research, 9-10, Kaga 1-chome, Itabashi-ku, Tokyo 173*

This is a preliminary report on the high-pressure experimental confirmation of the solidus phases of a cordierite-bearing granulite (Sample No. RVH92011102A ; T. KAWASAKI *et al.*: Proc. NIPR Symp. Antarct. Geosci., **6**, 47, 1993) collected from Rundvågshetta, Lützow-Holm Bay, East Antarctica. The constituent minerals of this granulite used as the starting material for the present experiments are sapphirine, cordierite, garnet, orthopyroxene, sillimanite, spinel, biotite, hornblende, K-feldspars, plagioclase, quartz and zircon. We found the decompressional reaction textures : (1) orthopyroxene and sillimanite are never in direct contact and are separated from each other by a canal of cordierite and/or cordierite + sapphirine ; (2) garnet is locally replaced by a symplectite composed of orthopyroxene + cordierite + sapphirine ± spinel ± plagioclase. The peak metamorphic condition before decompression was estimated as 900°C or more based on the initial orthopyroxene + sillimanite + garnet assemblage (T. KAWASAKI *et al.*, 1993, *ibid.*). This granulite is chemically characterized by high MgO (18.74 wt%), extremely low CaO (0.4 wt%) and relatively high K_2O (3.34 wt%) contents. The value for Mg/(Fe+Mg) of the bulk rock is 0.764. These chemical features are reflected in the appearance of the norm corundum (10.4 wt%) and the norm olivine (34.8 wt%), the disappearance of the norm quartz and the norm diopside, and relatively high ratios of the norm orthoclase (19.7 wt%).

High pressure experiments were carried out using a 16.0 mm piston cylinder device at Kochi University. We employed talc + Pyrex glass as a pressure medium (T. KAWASAKI *et al.*: Island Arc, **2**, 228, 1994). Cordierite is stable as a subsolidus phase in equilibrium with orthopyroxene, mica, rutile and plagioclase at 7 kbar and 850°C. At 10 kbar and 1000°C this granulite partially melts in the presence of vapor, and the solidus assemblage is cordierite + orthopyroxene + mica + rutile + sapphirine + spinel. At 7 kbar and 1050°C cordierite disappears, and the silicate melt contains about 69 wt% of SiO_2 in equilibrium with orthopyroxene, mica, rutile, sapphirine, spinel and vapor. At 9 kbar and 950°C garnet appears as the solidus phase instead of spinel. These experimental results suggest that silicic (granitic) magmas can be generated directly by the partial melting of granulites within the Earth's lower crust under water-saturated conditions even if the granulites, source materials of the silicic magma, were so defficient in silica as to give the norm olivine.

(Received March 14, 1994; Revised manuscript received May 6, 1994)

* Present address: Department of Earth Sciences, Faculty of Science, Ehime University, Matsuyama 790.