明るい岬産ザクロ石・普通角閃石コロナの成因

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Origin of garnet-hornblende corona in Akarui Point

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Symplectite composed of orthopyroxene, spinel and plagioclase occurs in garnet-hornblende gneisses from Akarui Point, Lützow-Holm Complex, East Antarctica. The following reaction may be responsible for the formation of the microstructure in the simplified CaO-FmO-Al_2O_3-SiO_2-H_2O system, where FmO denotes FeO + MgO,

2.8 Hornblende + 23 Garnet = 17 Orthopyroxene + 3.9 Spinel + 12 Plagioclase + 2.8 Fluid.

Modal abundance of spinel, plagioclase and orthopyroxene in the symplectite, which is obtained based on local bulk composition in terms of CaO-FmO-Al_2O_3-SiO_2 system, is almost constant within the symplectite irrespective of distance from the garnet, and shows a good agreement with the stoichiometric coefficients of the proposed reaction shown above. However, Mg/Fe of the local bulk composition increases systematically with increasing distance from the garnet. In addition, this ratio is much higher than those expected from the mole fraction of garnet and hornblede in the reaction.

This discrepancy can be accounted for by the fractional crystallization of orthopyroxene, spinel and plagioclase during decompression P-T path of the rocks, in which the local bulk composition effective for the reaction became low Mg/Fe by remaining high Mg/Fe orthopyroxene and spinel together with plagioclase behind the reaction front. This process reslults in the formation of reaction rim that has Mg/Fe ratio different from that of the sum of reactant garnet and hornblende. The formation of the features such that the corona has different bulk composition than the reactants have been explained in the system that was open to involve addition and subtraction of some components. The present study implies that such a difference in bulk composition between reactants and products does not necessarily require the system to belong to an open system.

The distribution coefficient of Fe and Mg between the orthopyroxene and adjacent spinel is almost constant whole in the corona, except at which retrograde gedrite occurs. The retrograde gedrite is in contact with orthopyroxene and spinel that show distinctly different distribution coefficient from other parts of the corona. This feature can be interpreted in two ways as below. Firstly, the rocks have experienced an isothermal decompression at a temperature under which orthopyroxene and spinel have equilibrated to show the present distribution coefficient. Secondly, each pair of orthopyroxene and spinel in the corona has re-equilibtated to show the present distribution coefficient after formation of the symplectite even though the local bulk composition was not homogenized. Relatively short duration of peak metamorphism and quick cooling, as suggested by other researches, may support the first interpretation.