

Distribution of trace elements between garnet and vesuvianite in the skarn: significance of REE behavior

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Trace element concentrations of garnet and vesuvianite from skarn in the Hirao Limestone, Kiura mine, and Chichibu mine have been examined. Garnet and vesuvianite are formed in the skarn in the Hirao Limestone located in northeast Kyushu. Many limestone mines was developed around this area. The limestone is thermally metamorphosed due to the Cretaceous Hirao granodiorite intrusion.

The Hirao Limestone contains a large numbers of thin basic dykes which have undergone the contact metamorphism to hornfels and skarn reaction zones developed between the dykes and the limestone. The skarn reaction zone has a non-equilibrium texture which consists of diopside, garnet, vesuvianite, and wollastonite. We reported the reaction zone formed by a magmatic fluid related to the Hirao granodiorite, which is rich in LREE and alkali components. We also found the vesuvianite is rich in REE; total REE = 2001-8980 ppm. In general, each REE pattern in vesuvianite and garnet is different. Vesuvianite has high concentration of LREE, and garnet is enriched in HREE. Thus, vesuvianite in the Hirao Limestone has high REE content due to the LREE-rich fluid. In other area, for example, vesuvianite in Kiura mine and Chichibu mine has low-REE content. These may indicate garnet in the Kiura mine Chichibu mine has higher REE content than vesuvianite. This result indicates that the concentration of vesuvianite and garnet reflect the fluid from granite origin. It is possible to know the fluid composition by their trace element concentrations.

In general, garnet does not have much radioactive elements. Garnet in skarn has the abundant trace elements, so garnet has a possibility of a mineral for a REE collecting mineral.