OXYGEN AND CARBON ISOTOPE STUDIES OF SKARNS AT SKALLEVIKHALSEN, EAST ANTARCTICA

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Abstract: The $^{18}O/^{16}O$ and $^{13}C/^{12}C$ ratios have been determined for carbonate minerals and graphite in skarns and metamorphic rocks at Skallevikhalsen, East Antarctica. The skarns in this area might be formed through high-grade granulite facies metamorphism of calcareous sediments and are divided into the following groups based on the field occurrence and the mineral paragenesis. 1) Banded and nodule-like skarn in recrystallized impure marble. 2) Massive skarn at or near marble-gneiss contacts. 3) Veinlet skarn. The $^{18}O/^{16}O$ and $^{13}C/^{12}C$ ratios of calcites in the skarns and the marbles are in the ranges from +9.6 to +21.9‰ (SMOW) and from −3.3 to +4.8‰ (PDB), respectively. The variations of these isotopic ratios become larger in order of the marble, the skarn and the nodule-like skarn. The relationships of carbon and oxygen isotope ratios are characteristically different from each other among the marbles and the three kinds of skarns.

Calcite and dolomite in about half of the samples studied, especially in the marbles, are isotopically equilibrated, implying a formation temperature of 600–800°C. On the other hand, in the skarns, the isotopic fractionations between calcite and graphite are in a range from +3.0 to +3.2‰, which are smaller by about 2‰ than the equillibrium values theoretically estimated at 600–800°C, but similar to the fractionation of the isotopes observed in some granulite facies marbles.

These results show that the metamorphic rocks and the skarns have not been subjected to large-scale homogenization of oxygen and carbon isotopes, though they were equilibrated in a short range at a high temperature. This suggests lacking of large-scale circulation of fluid at the skarnization stage.

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