Evidence of anisotoripic Fe-Mg interdiffusion in biotite from the Hidaka Metamorphic Belt, Hokkaido, Japan

Tadashi Usuki[1]

[1] Earth Sci,Chiba Univ

Garnet-biotite pairs with different crystallographic directions in a pelitic granulite from the Hidaka Metamorphic Belt shows a systematic variation of Fe-Mg profiles. Three types of bioite profiles are distinguished. Type-1 displays a flat profile and has a large the angle from the c-axis direction.Type-2 displays increasing of XMg toward the adjacent garnet linearly and the angle is relatively small. Type-3 displays a rapid increase near the adjacent garnet and the angle is very small(<10 degrees). Garnet profiles adjacent to Type-3 biotite displays very restricted diffusion. On the other hand, one adjacent to Type-1 biotite is more accelerated. Estimated Fe-Mg diffusivity of biotite in c-direction is 1/4 of that of garnet by 1 dimension diffusion modelling for garnet-biotite pair.

Garnet-biotite pairs with different crystallographic directions in a pelitic granulite from the Hidaka Metamorphic Belt shows a systematic variation of Fe-Mg profiles. Three types of bioite profiles are distinguished by its characteristic shape and crystallographic directions. Type-1 displays a flat profile and has a large angle from the c-axis direction.Type-2 displays an increase of XMg toward adjacent garnet linearly and the angle is relatively small. Type-3 displays a rapid increase near the adjacent garnet and the angle is very small(<10 degrees). Garnet profiles adjacent to Type-3 biotite displays very restricted diffusion. On the other hand, one adjacent to Type-1 biotite is more accelerated.

Estimated Fe-Mg interdiffusion coefficient of biotite in c-direction is 1/4 of that of garnet by 1 dimension diffusion modelling for garnet-biotite pair. This very small diffusivity of c-direction of biotite indicates that garnet-biotite diffusion models, such as geospeedometry, had been proposed should be re-examined.