Sm-Nd and Rb-Sr isotopic characters of metamorphic rocks from Howard Hills, East Antarctica

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The Napier Complex in East Antarctica consists of high-temperature granulite facies metamorphic rocks. The Howard Hills is a wide exposure of the Napier Complex at the east of Amundsen Bay. Large blocks of granulites with ultramafic to mafic compositions were found in felsic gneisses at the central part of northern Howard Hills. One of the block was constituted by core portion with olivine orthopyroxene-spinel-phlogopite assemblage and mantle constituted by almost orthopyroxene. Much phlogopite was partly formed at the margin of the block. The possibility of partial melting during metamorphism was suggested for the felsic gneisses in this area. To understand the crustal evolution of the Napier Complex, especially for elucidating the behavior of isotopic compositions during the metamorphism, Rb-Sr and Sm-Nd isotopic analyses were done for the metamorphic rocks from the Howard Hills.

Sm-Nd and Rb-Sr compositions of bulk rock samples from the granulite block were regressed to simple lines on the respective isochron diagrams. The line defined by Sm-Nd composition of them gives an age of 2.66 ± 0.05 Ga with an initial ratio of $^{143}Nd/^{144}Nd$ = 0.50856 ± 0.00004. The line regressed by the Rb-Sr composition gives an age of 2.63 ± 0.03 Ga with an initial ratio of $^{87}Sr/^{86}Sr$ = 0.7357 ± 0.0024. The coincidence between the Sm-Nd age and the Rb-Sr age suggests that isotopic homogenization of neodymium and strontium at about 2.65 Ga among the metamorphic rocks associating the granulite block. It is possible that the Sm-Nd and Rb-Sr ages of about 2.65 Ga indicate the age of granulite facies metamorphism with partial melting.

Recent results of SHRIMP and CHIME dating of zircon and monazite in the granulites from the Napier Complex show many evidences of a regional geological event at about 2.4 to 2.5 Ga. The ages of about 2.65 Ga in this study probably indicate the age of granulite facies metamorphism at the Howard Hills preceding the 2.4 to 2.5 Ga geological-geothermal event.

20μm spectrosocpy from large ground-based telescopes: Primary results and its potential

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One of the most surprising results of recent infrared observations is the discovery of ubiquitous crystalline silicates in dust shells around young and evolved stars. The crystalline silicates have a lot of sharp emission features in the mid-infrared wavelengths around 10-40 micron. These features have been observed only from satellite observatories such as the Infrared Space Observatory (ISO) since telluric atmosphere is opaque in the mid-infrared wavelengths.

In this decade several large telescopes at high altitude where the atmospheric absorptions are relatively weak become available for infrared observations. The SUBARU telescope is one of the largest infrared telescopes at an altitude of 4200m, and thus useful equipment for infrared observations. We developed a new mid-infrared instrument named COMICS for the SUBARU telescope. It has imaging and spectroscopic capabilites with high spatial resolution in the N-band (~ 10 micron) and the Q-band (~ 20 micron). In the Q-band spectroscopy, spectra between 16-21 micron with a resolving power of 2500 can be obtained. This is an unique and a powerful tool to study crystalline silicate features seen in astronomical objects.

With the COMICS we have a plan to carry out Q-band spectroscopy of stars with the crystalline silicate and obtain spatial distributions of the silicate dust around stars. So far two evolved stars AC Her and HD44179 have been observed.
In this presentation we will show details of the COMICS specifications and performances and the results of the Q-band spectroscopy of the stars. We also discuss the potential of the ground-based observations of crystalline silicate features around young stars.