Geochemistry of Li-enriched Zircon from the Napier Complex, East Antarctica

MAMI TAKEHARA[1], KENJI HORIE[1,2], 58TH JAPANESE ANTARCTIC RESEARCH EXPEDITION GEOLOGICAL FIELD SURVEY TEAM

[1] National Institute of Polar Research, 10-3, Midori-cho, Tachikawa-shi, Tokyo 190-8518, Japan. takehara.mami@nipr.ac.jp

[2] Graduate University for Advanced Studies (SOKENDAI), 10-3, Midori-cho, Tachikawa-shi, Tokyo 190-8518, Japan.

Zircon is one of the useful accessory-minerals for some geochronometers such as U-Pb dating, and the concentrations and isotopic ratios of major and trace elements have been used as an indicator of the magmatic and metamorphic environment. The concentrations and the isotopic ratios of Li in zircon analyzed using secondary ion mass spectrometer (SIMS) provide useful information for the existence of liquid water in the early earth's surface and the contribution to felsic magma (e.g., [1]). We found extreme Li-enriched zircons ([Li]: ~300-600 ppm) in orthopyroxene-felsic-gneiss collected from the Harvey Nunatak within the ultrahigh-temperature metamorphism region in the Napier Complex, East Antarctica by the 58th Japanese Antarctic Research Expedition (JARE-58) Geological Field Survey Team. The zircons are characterized based on the concentration of the other trace element (K, Ca, Mn, Fe, Al, P, and rare earth elements(REE)) analyzed by a single-collector type sensitive high-resolution ion microprobe (SHRIMP-IIe) [2].

Some of the zircon grains collected from the Opx-felsic gneiss are hydrothermally altered because the zircons indicate high concentrations of non-formula elements such as Ca, Mn, Fe, Al, K, and light REE. The altered zircon grains indicate lower Li concentrations than those of unaltered zircon grains. Oxygen isotope ratios ($\delta^{18}O_{VSMOW}$) in the unaltered zircons indicate a mean of 4.93 ± 0.09 ‰ and range from 4.31 to 5.34 ‰. In the altered zircons, oxygen isotope ratios range from 1.97 to 5.78 ‰, which suggests that the oxygen isotope ratios in the zircons were modified by the hydrothermal fluid. Also, we will report the Li isotope ratios in the zircons in this presentation.

[1] Ushikubo et al. (2008) Earth and Planetary Science Letters, 272, 666-676. [2] Takehara et al. (2018) Chemical Geology, 484, 168-178.