Nd isotopic analysis of silicates by using a 5-head advanced multi-collector sensitive high-resolution ion microprobe (SHRIMP-II/AMC)

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Geochronology using radio isotopes has played a pivotal role in the Earth Sciences over the last 30 years. Espacially, zircon has played a pivotal role in geochronology due to zircon's high physico-chemical durability and high closure temperature for many trace elements such as U, Th, Pb, and REE. Zirson is also characterized by high concentration of parent element uranium and its negligible incorporation of the daughter element Pb during crystallization. In addition, the paired decay scheme of ^{238}U and ^{235}U allows us to verify the disturbance of U–Pb decay system in the zircon crystal after crystallization, using two geochronometers. On the other hands, zircon is generally characterized by contents of rare earth elements (REE) with enrichment of heavier REE rather than lighter REE, and then there is possibility that the Sm–Nd decay system in zircon is geochronologically powerful tool. ^{147}Sm decays to ^{143}Nd by alpha decay with a half-life of 106 Ga ($\lambda_{1/2}$ = 6.54 x 10^{-12}). Because the half-life is so long, the resulting variations in Nd isotopic composition are small and require precise measurement.
A sensitive high resolution ion-microprobe (SHRIMP-II) is the first instrument offering the possibility to derive spatially resolved U–Pb age information from micro areas of polished samples, and has played a pivotal role in geochronology using accessory minerals such as zircon, monazite, titanite, and rutile and isotope geochemistry over the last 30 years. NIPR's second SHRIMP, installed in 2014, is first SHRIMP-IIe with the 5-head advanced multi-collector (AMC), and provides opportunity to get precise isotopic data in spots a few to tens of micrometers in diameter. The 5-head AMC consists of fixed axial head and four moveable heads and can install 5 independently positionable Faraday cups or continuous dynode electron multiplier (CDEM). This feature of the 5-head AMC allows a wider variety of high precision, *in-situ* isotope geochemistry using SHRIMP, such as 4 sulfur isotope analysis (^{32}S, ^{33}S, ^{34}S, and ^{36}S) and magnesium isotopes (^{24}Mg, ^{25}Mg, and ^{26}Mg), plus Al concentration in olivine. In this presentation, we report preliminary results for Nd isotopic analysis of ca. 25 μm-diameter spot in zircon.