Ion microprobe Th-Pb geochronology and Nd isotope geochemistry of rare earth element mineralization in South Korea

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In South Korea, rare earth element (REE) mineralization has been recognized in two localities; Chungju in the southwestern Okcheon metamorphic belt, and Hongcheon in the central Gyeonggi massif.

In the Chungju area, REE mineralization is hosted within Neoproterozoic alkaline metaigneous rocks. Ion microprobe dating of allanite yielded late Ordovician (444.6±8.0 Ma), Permian to Triassic (ca. 300–220 Ma) and early Jurassic (199–183 Ma) $^{208}Pb/^{232}Th$ ages. These multiple age components often coexist in single grains showing slight differences in backscattered electron brightness. The cores and rims of zircon from a syenite hosting REE ore bodies yielded Neoproterozoic (858.2±6.3 Ma) and early Jurassic (ca. 190 Ma) $^{206}Pb/^{238}U$ ages, respectively. Sub-grain Sm-Nd isotopic analyses of allanite indicate that REEs originating from the host rock have been recycled during multistage mineralization events.

In the Hongcheon area, REE ore bodies are hosted within a swarm of carbonatite dykes. Monazite, the main carrier phase of REEs, yielded a weighted mean $^{208}Pb/^{232}Th$ age of 232.9±1.6 Ma, which agrees with a weighted mean $^{206}Pb/^{238}U$ age of 227.2±8.3 Ma within uncertainties. The Nd isotope and trace element data deny a genetic linkage between the Hongcheon carbonatite and virtually coeval potassic and ultrapotassic silicate rocks recently documented in central Korea. The two magma types are therefore considered to have been generated independently from different lithospheric mantle sources.

Ion microprobe results described above demonstrate that the main REE mineralization in central Korea has occurred in association with the Permian-Triassic collision between the North and South China blocks. The early Jurassic mineralization events in the Chungju area are probably linked to the arc magmatism resulting from the paleo-Pacific plate subduction. The geotectonic significance of the late Ordovician event recorded in Chungju allanite is still unclear, but its temporal coincidence with the intraplate orogeny in South China [1] is noteworthy.

[1] Li *et al*. (2010) *GSA Bulletine* **122,** 772-793.