REE tetrad effect, negative Eu anomaly and oxygen isotope

SEUNG-GU LEE[1*], YOSHIHIRO ASAHARA[2], TSUYOSHI TANAKA[2], INSOO AHN[3], SEUNG RYEOL LEE[1] AND JONG IK LEE[3]

[1]Korea Institute of Geoscience and Mineral Resources, Daejeon 305-350, Korea (sgl@kigam.re.kr; leesr@kigam.re.kr)

[2]Nagoya University, Nagoya 464-8601, Japan (asahara@eps.nagoya-u.ac.jp; tanakat@nagoya-u.jp)

[3]Korea Polar Research Institute, Incheon406-840, Korea (isahn@kopri.re.kr;jilee@kopri.re.kr)

Rare earth elements (REEs) have been used as one of useful tools in geochemical and cosmochemical studies because of their similar chemical behaviors and their gradual changes in ionic radii. Recenlty, REE tetrad pattern has been considered as an example of a specific Sm/Nd fractionation in geologic systems such as evolved or highly-fractionated granites under the conditon that the REE measurement were performed at reasonable precison and accuracy. Then, such REE tetrad effect in the granite accompanies very large negative Eu anomaly.

In this study, we measured REE abundances with high precison and accuracy within 5-10% for clarifying the order tetrad REE pattern and negative Eu anomaly. We also measured oxygen isotope for whole rock and its constituent minerals to survey hydrothermal effect due to water-rock interaction. The oxygen isotopes of the granites and their constituent minerals are plotted on the terretrial fractionation line suggesting that they are derived from the same source magma rather than hydrothermal alteration. Our data showed that Eu anomalies of the granites with REE tetrad pattern should be derived from K-feldspar fractionation rather than from a fractionation between the residual melt and a coexisting aqueous high temperature fluid. Our data also indicate that the formation of REE tetrad effect and negative Eu anomaly might have occurred concurrently. In this study, we could reconfirm that REE tetrad effect is a product by a specific magma fractionation not by hydrothermal alteration.