Rare Earth Element Chemistry of Apatites from the Cretaceous to Paleogene Granitoids, Southeastern Tibet

M.F. Chu (1), S.L. Chung (1), X.R. Liang (2), W.L. Griffin (3), N.J. Pearson (3), Yoshiyuki Iizuka (4), X.H. Li (2), Y.Q. Zhang (2)
(1) Department of Geosciences, National Taiwan University, Taipei, Taiwan, (2) Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, Guangzhou, China, (3) GEMOC, Maquarie University, Sydney, Australia, (4) Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan
E-mail: f88224109@ntu.edu.tw/Fax: +886-2-23636095

Accessory minerals such as zircon and apatite occur widely in various rocks because of their wide stability in geological processes, which allow these minerals to be used as an indicator for not only igneous petrogenesis but also potentially for sedimentary source provenance. In this study, using EPMA and LA-ICP-MS composed of New Wave LUV-213 Nd-YAG laser and Agilent quadrupole ICP-MS, we measured major and trace element concentrations of apatite separates from two principal types of Cretaceous to Paleogene granitoids from SE Tibet. These are (1) the I-type Gangdese Batholith [~100-40 Ma old; with SiO2= 50-75 wt.%, ASI= 0.78-1.12, (La/Yb)n= 2.3-21, (Eu/Eu*)n= 0.15-1.83, εNd(T)= -1.6 to 3.7] and (2) the S-type Nyainqentanglha magmatic belt [≥ 120 Ma; SiO2= 66-73 wt.%, ASI= 1.07-1.30, (La/Yb)n= 6.5-23.1, (Eu/Eu*)n= 0.31-1.03, εNd(T)= -10 to -16]. Although no systematic variations are observed in major elements for apatites from the two types of granitoids, their trace elements, in particular rare earth elements (REE), have markedly differences. Apatites from the I-type rocks are highly LREE-enriched and thus show steep REE patterns [(La/Yb)n= 56-67], in contrast to those from the S-type rocks which show flat REE patterns [(La/Yb)n= 0.84-0.99]. Moreover, whereas the latter are characterized by strong negative Eu anomalies [(Eu/Eu*)n= 0.11-0.13], the former display only mild amounts of negative Eu anomalies [(Eu/Eu*)n= 0.78-0.84]. Given the fact that both I- and S-types of the Tibetan granitoids have LREE-enriched patterns, the "apparent" values of REE partition coefficients calculated by dividing REE abundances of the apatites over those of the host rocks are distinct between the two rock types. Our study indicates that REE chemistry of the apatites (1) changes between different types of the host magmas and thus may be used as a probe into igneous petrogenesis, and (2) has potential to be used as a sedimentary provenance indicator in particular when combined with *in-situ* Sr isotope determinations of these apatites to be carried out.