Origin and source material of Y000749 naklite

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SNC meteorites are widely considered to be derived from Mars (McSween,1994). Therefore, these meteorites have been studied intensively to understand the magmatism on Mars. Although the parent magma compositions and crystallization histories of Martian magmas have been well examined (e.g., Longhi and Pan, 1989; Harvey and McSween, 1992), the source materials of Martian magmas are not yet fully understood. Consequently, the nature and the origin of the source materials are still ambiguous.

Recently, Shimoda et al. (2003) have proposed a model which constrains the geochemical characters of source materials of Martian magmas. According to their model, Martian magmas were produced by two-stage melting of a plume uprising from the deepest mantle. In addition, the nakhlite magmas were inferred to be produced by the first-stage melting of the uprising plume. Thus it is important to reveal the geochemical characteristics of source material of nakhlite magmas for the better understanding of Martian magmatism.

In this study, we determine REE composition of pyroxene cores in Y000749 nakhlite, which has been found in Antarctica desert recently. The REE pattern of Y000749 pyroxene cores shows middle REE enrichment which is similar to those of Nakhla, Lafayette and Governador Valadares (Wadhwa and Crozaz, 1995). It is therefore suggested that all of these nakhlites derived from the source materials of which geochemical characters are similar. Furthermore, this REE patterns of nakhlites indicate that these magmas were not produced by melting of peridotite or material with chondritic composition. However, nakhlite magmas could be produced by a pyroxene-rich material. If this is the case, depleted isotopic characters and enriched middle-REE patterns of nakhlites (Nakamura et al., 1982; Shih, 1982) can be easily understood. The higher REE concentrations of Y000749 would suggest that Y000749 is more evolved magma or produced by relatively small degree of partial melting compared to other nakhlites.