

Estimation of the practical partition coefficients of rare earth elements between limestone and seawater: discussion and application

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The rare earth element (REE) abundances in seawater are controlled by factors concerning different input sources (e.g., terrestrial input due to weathering, hydrothermal fluid) and scavenging process related to depth, salinity and oxygen levels (e.g., Piepgras and Jacobsen, 1992). In order to examine paleo-oceanic environments, the REE abundances in paleoseawater can be utilized as a clue, and estimated combining the REE data of limestone with the REE partition coefficients between limestone and seawater (Webb and Kamber, 2000).

In the present study, the practical REE partition coefficients between limestone and seawater were examined by comparing the data of some young limestones, the present-day biogenic carbonates and the experimentally obtained ones. The plausible REE partition coefficients for limestone were obtained from the REE data of Quaternary limestones and modern seawaters. The inferred partition coefficients range from 214 for La to 327 for Ce, and show almost flat REE pattern. To estimate the REE pattern in paleoseawater, these partition coefficients were applied to the REE data in some Quaternary to Silurian limestones from Japan. The obtained REE patterns in the paleoseawater show variable sizes of negative Ce anomalies and LREE depletions as seen in those of the modern seawaters. Such obtained REE patterns in the paleoseawaters suggest adequacy of the practical partition coefficients. Moreover, this study includes the examinations on the dissolution methods for limestones using acetic acid and HCl as well as on their residual materials. Furthermore, the effects of terrigenous materials to the REE abundances are discussed.

References: Piepgras and Jacobsen (1992) *Geochim. Cosmochim. Acta* 56, 1851–1862; Webb and Kamber (2000) *Geochim. Cosmochim. Acta* 64, 1557–1565.

Keywords: Limestone, Rare earth elements, paleoseawater, Partition coefficients