Historical development of $^{138}Ce/^{142}Ce$ analysis and applications of La-Ce isotope systematics

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Long-lived radioactive nuclides are used to elucidate evolution and differentiation of various geological samples through the time. In contrast to well-known nuclides such as ^{87}Rb and ^{147}Sm, ^{138}La is categorized as one of the specialized isotope scheme [1], which decays to ^{138}Ba and ^{138}Ce with its half-life of $1.05x10^{11}$ yr. The La-Ce decay system is favored like Sm-Nd decay system because the two elements belong to rare earth elements (REE), which have very similar chemical behavior in geological processes.

The geological application of La-Ce isotope systmatics was initiated in 1982 by Tanaka and Masuda, and then the decay system has applied to various types of samples [3]. The amount of decay contribution to ^{138}Ce over 4.6 Ga is very small, however, and evolution of samples based on La-Ce system must be discussed with large uncertainties, compared to Rb-Sr and Sm-Nd systems even after several technical developments of Ce isotopic analysis [4]. Recently, La-Ce isotope systematics is revived owing to newly designed state-of-the-art mass spectrometers for precise isotopic analysis, and has been requested to have a consistency among reported data with a common isotopic reference material [5].

In this presentation, we summarize the reported Ce data of geological samples with reference materials, and its historical technical difficulties and developments will be outlined. Current situation of Ce isotopic analysis is also discussed including recent analytical trends, and its potential applications will be suggested from the combination with Sm-Nd systematics to trace REE fractionation during geological processes and the origin of Ce anomaly.

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