
Oral | Symbol B (Biogeosciences) | B-PT Paleontology

[B-PT23_30PM2]Decoding the history of Earth: From Hadean to Modern

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Wed. Apr 30, 2014 4:15 PM - 6:09 PM 411 (4F)

The latest results of Earth's evolution and geological processes through 4.6 billion years from Hadean to Modern, based on various approaches including fieldworks, chemical analyses, experiments and computer simulation, will be presented. In this session, we aim to discuss and understand causal relationships and interplay among the evolution of Earth's deep interior, changes in the surface environments, and development and evolution of life. Wide-ranging topics are accepted.

6:00 PM - 6:09 PM

[BPT23-P03_PG]Major element composition and forming condotion of the hidden reservoir

3-min talk in an oral session

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Keywords:hidden reservoir, proto-crust, $^{142}\text{Nd}/^{144}\text{Nd}$

Solidification of the magma-ocean and subsequent mantle-crust differentiation could have significant influence on the evolution of the solid Earth and hydrosphere, but its detail is still unclear. Previous studies have suggested that the difference in $^{142}\text{Nd}/^{144}\text{Nd}$ between chondrites and bulk silicate Earth (BSE) resulted from the formation of an incompatible element-rich reservoir that had formed in the early Earth and then got hidden into the Earth's interior or lost outside the Earth. Although various models for the composition and the origin of such a "hidden reservoir" have been proposed, they have not focused on the major element composition of the hidden reservoir. However, the major element composition is crucial to know the density of the hidden reservoir and to examine whether the hidden reservoir rose to form the proto-crust or sunk in the early mantle. In order to determine the major element composition of the hidden reservoir, we estimated the melting condition for the formation of the hidden reservoir with constraints of $^{142}\text{Nd}/^{144}\text{Nd}$ and $^{143}\text{Nd}/^{144}\text{Nd}$ systematics in the ancient and modern mantle. This study assumed that the hidden reservoir had formed at pressures less than 10 GPa, on the basis of previous studies that estimated the initial depth of melt segregation to be at this pressure range in the solidifying magma ocean. Then we calculated the Sm/Nd ratio that is conformable to the difference in $^{142}\text{Nd}/^{144}\text{Nd}$ between chondrites and BSE, and estimated the melt fraction that satisfies this Sm/Nd ratio. From this calculation, the melt fraction was estimated to be Journal of Geophysical Research, **98**, 5407-5418 Korenaga(2009), *Geophysical Journal International*, **179**, 154-170