

**【Grant-in-Aid for Scientific Research(S)
Science and Engineering (Engineering II)**



Title of Project : Comprehensive Research on Deep-sea Metalliferous Sediments as a New Mineral Resource

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Research Area : Earth System and Resources Engineering

Keyword : Seafloor Mineral Resource, Resource Exploration, Global Material Cycle

【Purpose and Background of the Research】

We have found out that metalliferous sediments containing rare earth elements (REEs) that are very important materials for Japanese cutting-edge industries are relatively widely distributed in the Pacific Ocean. The newly-discovered mineral resource (“mineral resource mud”) is characterized by (1) high REE contents, (2) huge reserves and easy exploration, (3) very low U and Th contents, and (4) easy recovery of REEs by weak acid. The purposes of this project are (a) to reveal the distribution and REE content variation of metalliferous sediments in the Pacific Ocean, the host minerals of REEs in the sediments, and mechanism and processes of ore formation, (b) to develop the REE potential mapping in the Pacific Ocean and to select the promising area of REE resource, and (c) to make policy recommendations on the development of the new mineral resource to the Japanese government.

【Research Methods】

The study samples of this project are approximately 5,000 sediment samples of 65 Deep Sea Drilling Project/Ocean Drilling Program (DSDP/ODP) cores obtained from the Pacific Ocean. The constituent minerals will be determined by microscopic observation and X-ray diffractometry (XRD). Major and trace elements including REEs will be analyzed by X-ray fluorescence (XRF) and inductively coupled plasma mass spectrometry (ICP-MS). The relatively new independent component analysis will be used for extracting independent features in multivariate compositional space. Leaching experiments of REEs and other trace metals by acid and alkali solutions will be conducted for selected samples.

【Expected Research Achievements and Scientific Significance】

Source materials and host minerals for REEs in the metalliferous sediments and mechanism and processes of ore formation will be entirely revealed by the present project. In addition, secular variations of hydrothermal, hydrogenous, biological, and terrigenous components and fluxes in the study core

samples that were deposited in the Pacific Ocean during the Cenozoic are expected to be uncovered by our new data. We can reveal the Earth’s dynamic processes producing the new mineral resource, which in turn provide us very useful information to restrict the promising area of the REE resource in the Pacific Ocean more tightly.

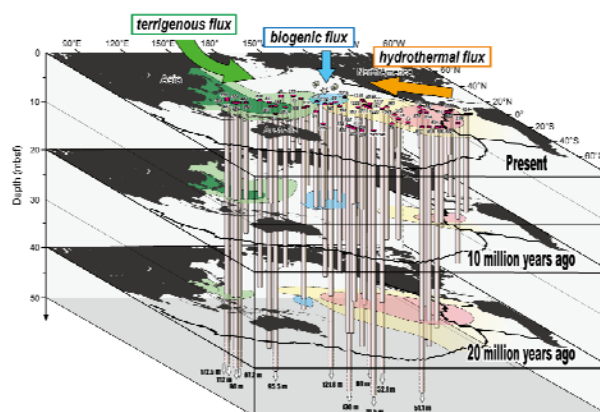


Fig. 1 DSDP/ODP cores studied in this project and hypothetical secular variations of each flux in the Pacific sediments.

【Publications Relevant to the Project】

- Kato, Y., Yamaguchi, K. and Ohmoto, H.: Rare earth elements in Precambrian banded iron formations: Secular changes of Ce and Eu anomalies and evolution of atmospheric oxygen. Geological Society of America Memoir 198, 269-289, 2006
- Kato, Y., Fujinaga, K. and Suzuki, K.: Major and trace element geochemistry and Os isotopic composition of metalliferous umbers from the Late Cretaceous Japanese accretionary complex. Geochemistry Geophysics Geosystem vol. 7, Q07004, doi: 10.1029/2005GC000920, 2005

【Term of Project】 FY2010-2014

【Budget Allocation】 121,300 Thousand Yen

【Homepage Address and Other Contact Information】

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