

## **REY-rich mud: A perspective on science and engineering of the new REY resource**

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The potential of deep-sea “REY-rich mud” in the Pacific Ocean as a new resource for rare-earth elements and yttrium (REY) has been reported in 2011 [1]. The mud has multiple advantages as a mineral resource: e.g., enormous resource potential, very low contents of radioactive elements, easy leaching/refining. In 2013, JAMSTEC and the University of Tokyo revealed that the REY-rich mud with  $\Sigma$ REY contents more than 6,000 ppm exists at a very shallow depth (2 to 4 meters) below the seafloor in the Japanese Exclusive Economic Zone (EEZ) around Minamitorishima Island that is located ~1,900 km southeast of Tokyo [2].

Since the discovery of the “extremely REY-rich mud”, we have conducted a comprehensive study with various approaches such as geochemical analyses, detailed microscopic observations, REY-leaching experiments, application of sub-bottom profiling to the exploration, and statistical analysis of the geochemical data set, towards the exploitation of the new and highly promising REY-resource in the near future. In addition, together with private-sector corporations, we are also starting to address the challenges for developing the deep-sea REY-rich mud deposit, including various technical issues (e.g., how to lift the mud from the seabed deeper than 5,000 m of water depth) and economic evaluations. The collaborative efforts of industry, academia, and the government are the key to success of deep-sea mining of REY-rich mud.

Here we report a general overview of our latest researches to unravel the genesis of the REY-rich mud in the Minamitorishima EEZ, together with our development system for the REY-rich mud deposits.

[1] Kato, Y. et al. (2011) *Nature Geoscience* **4**, 535–539.

[2] Fujinaga, K. et al. (2013) *JpGU Meeting 2013*, SGC54-05.