Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.5528

Stratigraphic variations in geochemistry and morphology of Fe–Mn micronodules: Implications for the formation process of extremely REY-rich mud in the western North Pacific Ocean

KAZUTAKA YASUKAWA[1,2,3], SATOSHI KINO[3], JUNICHIRO OHTA[1,2,3], KEISHIRO AZAMI[3], ERIKA TANAKA[3], KAZUHIDE MIMURA[3], KOICHIRO FUJINAGA[1,2], KENTARO NAKAMURA[3] AND YASUHIRO KATO[1,2,3]

[1]Frontier Research Center for Energy and Resources, School of Engineering, The University of Tokyo

[2]Ocean Resources Research Center for Next Generation, Chiba Institute of Technology

[3]Department of Systems Innovation, School of Engineering, The University of Tokyo

Presenting Author: k-yasukawa@sys.t.u-tokyo.ac.jp

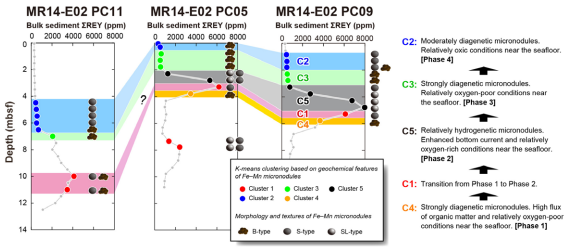

Figure 1. Stratigraphic correlation of the geochemical features and surficial textures of the Fe–Mn micronodules. C1 to C5 indicate the result of k-means cluster analysis of the chemical compositions of the micronodules, which may reflect the environmental conditions.

Deep-sea sediments around Minamitorishima Island, that is, the easternmost island of Japan in the western North Pacific Ocean, exhibit a total rare-earth element and yttrium (REY) content of up to 8000 ppm [1]. We investigated stratigraphic variations in the chemical compositions and textures of ferromanganese (Fe–Mn) micronodules separated from the western North Pacific sediments, including the extremely REY-rich mud [2, 3]. The characteristics of the micronodules of an extremely REY-rich mud layer vary from almost purely diagenetic to relatively hydrogenetic. This indicates the abundant supply of organic matter to the sediment together with fish debris that accumulates REY at the onset of the REY-enrichment of the mud, followed by the exposure of the seafloor to oxic water masses during the latter half of the formation of the REY-enriched layer. These results support a previously proposed formation mechanism based on which enhanced bottom water currents caused pelagic fish proliferation via the upwelling of nutrients and fish debris was physically sorted and selectively accumulated on the seafloor [4]. In the upper part of the sediment column, the micronodules exhibit varying diagenetic signatures, suggesting changes in the bottom current intensities after the main REY-enrichment. However, the bulk REY contents of the sediment do not increase in this phase. This implies that a sufficient increase in the fish productivity is an essential factor for the formation of the extremely REY-rich mud.

[1] Takaya et al. (2018) Sci. Rep. 8, 5763. [2] Yasukawa et al. (2020) Ore Geol. Rev. 127, 103805. [3] Yasukawa et al. Minerals, under review. [4] Ohta et al. (2020) Sci. Rep. 10, 9896.