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Origin of Heavy-REE-rich apatite in deep-sea mud from Minami-Torishima area, south-eastern Japan

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We have conducted geochemical and mineralogical investigations of the rare earth and yttrium (REY)-rich mud from Minami-Torishima area in the Pacific in order to clarify the concentration of REY and their host-phase in the mud. X-ray diffraction analysis shows that the mud is mainly composed of phillipsite, fluorapatite, quartz, albite, illite and montmorillonite. Whole-rock CaO, P2O5 and total REY contents of the mud are positively correlated. Relative abundance of apatite is also positively correlated to P2O5 and total REY contents. These correlations suggest that apatite is the main host of the P2O5 and REY in the mud. In order to quantitatively estimate the REY-host phase, we make in-situ compositional analyses of constituent minerals in the REY-mud. The result shows that the apatite is abundant in REY (9300 to 32000 ppm) and characterized by negative Ce-anomaly. In contrast, phillipsite is less abundant in REY (60 to 170 ppm). We conclude that the main REY host phase of the mud is apatite.

Keywords: REE, deep-sea mud, apatite, Minami-Torishima, LA-ICPMS, Nd isotope