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Major and trace elements geochemistry of Co-rich ferromanganese crust from the #5 Takuyo Seamount, northwestern Pacific

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Large amount of hydrogenetic cobalt-rich ferromanganese (Fe-Mn) crusts are known to occur on the surface of seamounts or ocean plateaus in the Pacific Ocean. The Fe-Mn crust is one of the most promising seafloor mineral resources enriched in not only Cu, Co, and Ni but also REE and PGE. Here we report the geochemical features of the Fe-Mn crusts collected from the #5 Takuyo Seamount, which is located 120 km west from the Minami-torishima Island, northwestern Pacific.

The amounts of trace elements in the crusts are controlled by the MnO₂(or Fe₂O₃) content: Those of Ni, and Cu are roughly proportional to the MnO₂ contents, while REE, especially HREE, show strong positive correlation with the Fe₂O₃ content. The Mn/Fe ratios decrease toward the surface of the crusts in all samples taken at various water depths between 965m and 2987m. The Fe/Mn ratios of crust samples from the surface part within 3 mm tend to be higher along with the increase of water depths, which is similar to the vertical profile of dissolved oxygen amount in the Pacific Ocean. The crusts are characterized by high total REE contents (La-Lu) varying from 1267 to 2168 ppm (average 1660 ppm). PAAS-normalized REE patterns show flat patterns with conspicuous positive Ce anomalies. We believe that the Fe-Mn crusts are promising alternative as the source of HREE because of the high REE contents and the large ore reserve.

Keywords: ferromanganese crust, minor elements, #5 Takuyo Seamount, REE, resource evaluation