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オスミウム同位体比に基づく拓洋第五海山における鉄マンガンクラスト成長速度の時間・空間変化
Temporal and spatial variation in growth rates of Fe-Mn crusts from the #5 Takuyo Smt using osmium isotope compositions

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A ferromanganese crust (Fe-Mn crust) records geochemical information of ambient seawater and is known as a useful material for deciphering the paleocean environmental changes throughout the Cenozoic period (e.g., Klemm et al., 2005; Burton, 2006). Based on the osmium (Os) isotope stratigraphy, recent studies proposed that a growth rate of the Fe-Mn crust was changed significantly and that its variation in the growth rate was attributable to global ocean environmental changes (Klemm et al., 2005; Li et al., 2008; Meng et al., 2008). However, due to the lack of detailed studies constraining the temporal and spatial variations in the growth rate of Fe-Mn crusts, the linkage between their growth rates and marine conditions is still poorly understood.

Here, we report the temporal and depth variations in the growth rate of Fe-Mn crusts on the basis of the Os isotope composition. Our samples were collected systematically from the Takuyo Daigo Seamount (#5 Takuyo Smt) by ROV Hyper Dolphin / RV Natsushima (NT09-02 Leg.2 cruise) with manipulator and underwater diamond saw. The Os isotope compositions of two Fe-Mn crust samples collected from 1440 and 2987 mbsl exhibit a similar trend and their values are almost the same as the seawater Os isotope record from present to 12 Ma, demonstrating that the growth rates of Fe-Mn crusts from the #5 Takuyo Smt are constant regardless of sea depth. This is consistent with the growth rate determined by the Be-10 dating method. However, in the older part (bottom part in the side of basement rock) of Fe-Mn crust collected from 1440 mbsl, the Os isotope compositions have a large deviation from the seawater Os isotope record. Moreover, the Fe-Mn crust collected from 2987 mbsl totally lacks the section older than 12 Ma. These results suggest that (1) the existence of the growth hiatus older than 12 Ma, recognized in the previous studies (Klemm et al., 2005; Li et al., 2008; Meng et al., 2008) or (2) the bottom part of Fe-Mn crust older than 12 Ma at 2987 mbsl was simply eroded and disappeared by land slide of the #5 Takuyo Smt.

The present study is the first attempt to comprehend the spatial/depth variation in the growth rate of Fe-Mn crusts using the Os isotope stratigraphy. It is turned out that the growth rate of Fe-Mn crusts collected from different depth is constant and sedimentary age determined by Os isotope composition is consistent with that of the Be-10 dating method. In the future research, we will conduct the Os isotope geochronology to various Fe-Mn crust samples from various localities and elucidate whether or not the growth hiatus is related with the global ocean environmental changes.

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