

Ferromanganese nodules of the Kara Sea (Arctic region): Correlation between organic matter and Mn/Fe ratio

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We present the results of investigation of organic matter in Fe-Mn nodules (the main sources and features of transformation) and correlation between organic matter (OM) and main ore elements.

Kara Sea is a marginal Arctic shelf-sea with intense discharge of the Ob and Yenisei rivers and high sedimentation rate. More than 50 samples of Fe-Mn nodules were collected in October, 2013 along the North-East continental margin of the Kara Sea from depths of 50–100 m. In this part of the sea nodules were found for the first time. The recovered samples are divided into three major morphological types: tabular, discoidal and cup-shaped. Surface colour is independent of nodule size or shape and varies from light orange (Fe oxyhydroxides) to black (Mn oxides). Diameter of the samples varies from 5 to 15 cm.

A content of total organic carbon (TOC) analyzed in 16 bulk samples strongly varies from nodule to nodule. Its mean value of 0.66 % is comparable with sediments of the Kara Sea, substantially higher than in deep-sea polymetallic nodules (av. 0.1%) and quite similar to ferromanganese concretions from the Black Sea (av. 0.7%) [1].

Analysis of distribution and group composition of n-alkanes $C_{12} - C_{33}$ revealed various sources of OM in the studied samples: significant input either terrigenous or the marine autochthonous components. Organic matter of Fe-Mn nodules was found to be immature and low-biodegraded. For the first time we demonstrate a correlation between the dominant source of OM and Mn/Fe ratio. In Mn-rich samples this ratio is about 2.5 and the main source of OM appears to be terrestrial. Conversely, in the Fe-rich samples OM is mostly of marine origin.

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[1] Baturin G.N. et al. (2011) *Oceanology* **51**, № 1, 148-156.