

Chemical composition of ferromanganese nodules from the Kara Sea, Arctic region

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Concentrations of 45 elements were determined with ICP-MS and ICP-AES techniques in the 16 ferromanganese nodule samples collected in the Kara Sea during the 125th cruise of R/V "Professor Shtockman", 2013.

The contents of the main ore components of these nodules, Fe and Mn, were found to be 4.1-25.4% and 2.0-26.5%, respectively, which is comparable with the nodules found in the other region of the Kara Sea [1]. Analysis of different layers, singled out visually by colour, showed that Mn/Fe ratio varies from 0.09 to 5.20.

Among microelements, the ones of great interest are Ni, Co, Cu, Mo, Ag, Au, Cd, Bi, Te, Tl, as well as rare earth elements (REE). We demonstrate, that the content of some elements is lower than in the oceanic nodules, but higher than in the nodules from most of the Arctic shelf seas. We revealed relatively high concentrations of Ni (73.5-481.0 ppm), Cu (40.1-182 ppm), Co (36.4-293.0 ppm), and Zn (74.2-238.0 ppm). For the samples collected near the shore significant Mo enrichment was found (555 and 646 ppm), while the average content of Mo was estimated as 341.2 ppm.

The contents of noble metal, such as Au and Pt was below the detection limit, Ag – 0.01-5.5 ppm.

The total content of 14 REE varied from 116.2 to 247 ppm.

The concentrations of Y and Zr are very similar to the data reported by Baturin for the samples from St. Anna Trough [1] and were found to be 34.0 и 62.7 ppm, respectively.

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[1] Baturin G.N. (2011) *Oceanology* **51**, №1, 153-161.