Platinum group elements and Au in surface and buried nodules from Brazil Basin

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The interest to platinum group elements (PGE) behavior in the ferromanganese ore formation in the ocean is linked with their appreciable accumulation in crusts and nodules. PGE are not a geochemically coherent group, displaying various degrees of oxidation in the marine environment and entering into various complexation reactions. The most studied elements are platinum and palladium. Palladium does not accumulate in crusts and nodules. High concentration of platinum is usually found in hydrogenous ferromanganese deposits. In diagenetic nodules and hydrothermal crusts, platinum does not accumulate. The mechanism of platinum accumulation can probably be described by the oxidative sorption of Pt(II) on δ-MnO_2 [1].

In this work, we presented data on Ru, Pd, Ir, Pt and Au in ferromanganese nodules from Brasil Basin. Samples were obtained in 18 cruise "Akademik Sergey Vavilov" at station 1536 (22°18′S, 24°01′W, 5500 m depth) and station 1541 (6°11′S, 24°01′W, 5800 m depth). Nodules were found both on sediment surface and buried in sediments at a depth of 83 cm below sea floor (station 1536) and 418 cm (station 1541). Concentrations of PGE and Au were determined by ICP-MS after anion exchange preconcentration [2]. Ferromanganese nodules from surface sediments show Mn/Fe =1.1-1.5 and relate to hydrogenous type of deposits. They are enriched in cobalt and have positive cerium anomaly compared to PAAS (Ce an=3.05-3.33). The chemical composition of buried nodule from depth 418 cm is similar to surface nodules from both stations but noticeably differs from nodule at a depth of 83 cm. Nodule at a depth of 83 cm is enriched with iron (Mn/Fe=0.4), depleted in Co, Ni, and Cu, but have strong positive Ce anomaly (Ce an = 36.7). All studied nodules are enriched in platinum (110 – 247 ng/g) and depleted in palladium (1.1 – 2.8 ng/g). The highest content of platinum was determined in buried nodule at a depth of 83 cm. Ruthenium and iridium concentrations varied little and did not exceed values of 19 and 3 ng/g respectively. The PGE and gold enrichment decrease in order Pt>Ru>Ir>Pd>Au and not depend on age of ferromanganese nodules.

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1. Maeno et al., (2015) Miner. Deposita 51, 1–8.
2. Berezhnaya, Dubinin. (2017) GGR 41.1,137-145.