Geochemical typification of hydrothermal sulfide ores in the ocean

S. ANDREEV, S. BABAEVA* AND V. KAZAKOVA

FGUP VNIIOkeangeologia 1, Angliysky Avenue, St. Petesburg,190121,Russia
(*correspondence: sveta.babaeva@gmail.com)

A systematic study of oceanic hydrothermal sulfide ore allowed the authors to collect a vast original and published actual material on the material composition of over 125 ore objects (nearly exhaustive in 2012) in different areas of the ocean. The statistical processing allowed geochemical typification of these ore formations using a unified approach to the analysis of geochemical characteristics of the ores inside the major oceanic structures and in the local areas.

The geochemical typification of ore uses center contents of the main useful components throughout the ocean – Cu=2,6 %, Zn=7,8 %, and the ratios between particular values and calculated averages. Prior to this, the ores of the sulfur-pyrite type with low contents of Cu≤1,0 % and Zn≤2,0 % are extracted from the data array. While separating the ores into different types using certain coefficients, we put into a formula to the first place the element with the higher value, and the element with the lower value to the second place, or we indicate that the second element belongs to the group of poor pyrite ores. This approach allows to embrace all possible variations of concentrations of Cu and Zn in the sulfide ores. These variations are five: Cu - pyrite (Cu>1,0 %; Zn≤ 2,0 %), Zn – pyrite (Zn>2,0%; Cu≤1,0 %), Cu–Zn and Zn–Cu (Cu>1,0 %; Zn>2,0 %); sulfur-pyrite (Cu≤1,0 %, Zn≤2,0 %). The latter does not seem very important The atakamite ores CuCl(OH)3, associated with the sulfides, characterized by the obvious dominance of Cu over Fe, do not fit into the classification scheme.

Conclusion

Geochemical typification of the ores allows comparing various ore formations and defining the predominant geochemical specialization: Cu – pyrite in the Atlantic Ocean; increase of the Zn part in the Indian Ocean, Zn–Cu in the Pacific, Cu–Zn and Zn–Cu in the West Pacific transition zone. In the PACMANUS region (Sea of New Guinea) two types of sulfide ore are present: Zn–Cu with increased Ag and Cu–Zn with increased Au and Ag, or only Au. Inside the Russian Application Area on the MAR predominant is Cu-pyrite and S-Pyrite types of ore with increased content of Au.