Paper Number: 2245

Systematization of deep-sea polymetallic sulfides of the Mid-Atlantic Ridge

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As a result of 30 years of studying the Mid-Atlantic Ridge (MAR) by Russian geologists within the Russian Prospection Area (RPA), 20 hydrothermal vent fields of deep-sea polymetallic sulfides (DSPS), similar to land –based volcanic massive sulfide deposits, have been identified. The RPA is located in the low-speed interval of the Indo-Atlantic segment and stretches as a narrow band 20-50 km wide, along the axial MAR rift in the range 12^0 40' - 20^0 54'N.

The need for comparative evaluation of these deposits, in terms of both basic research and practical significance, requires a unified approach to the description of different chemical and mineralogical DSPS composition.

We recommend carrying out a systematic ordered comparative analysis of the DSPS deposits based on their geochemical specialization, mineralogical typification, genetic aspects of oceanic sulfide mineralization, grading by morphology into structural and textural types, and geological/tectonic position of the mineralized bodies.

The main useful components of the ridge oceanic sulfides are Cu, to a lesser extent Zn. Au and Ag are the associated elements. The list of trace elements includes Se, Te, Co, Pb, Cd, Ge, Ga, Tl, In, and others.

The geochemical types are defined according to classification based on following copper

and zinc ratio:

"Fe-S" - Cu<1.0%, Zn<2%;

"Cu-Fe" - Cu≥1.0%, Zn<2%;

"Zn-Fe" - Zn≥2%, Cu<1.0%;

"Cu-Zn" - Zn≥2%, Cu≥1%, Cu/2.6 >Zn/7.8 (2.6 and 7.8 - average metal content (%) of copper and zinc in DSPS of the World Ocean).

Massive mineralized bodies are composed of pyrite, marcasite, chalcopyrite main types. These deposits contain sphalerite, isocubanite, pyrrhotite, secondary copper sulfides, iron oxides and hydroxides in subordinate quantities.

The genetic aspect is new for oceanic ores; it includes the primary massive sulfides, the secondary sulfidic enrichment, and the leaching and oxidation zones where the formation of atacamite and iron hydroxides takes place.

An important classification feature is a morphological and geological/tectonic position of ore bodies, that are divided into those located on the sides and the bottom of a rift valley, those associated with cross structures and volcanoes and those located on the flanks of the mid-ocean ridge.

The above characteristics are combined in a unified system of evaluation parameters, which allow comparing diverse, by composition and mode of DSPS deposit occurrence, and choosing the most interesting and significant ones in geological and economical respect.