



Os isotope composition of sulfide ores and host mafic-ultramafic rocks from hydrothermal field 12°45'N MAR

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Great potential of Re-Os isotope system as a tool for hydrothermal sulfide ore study and searching of the metal sources has already been demonstrated (Ravizza et al., 1996; Brüggmann et al., 1998; Roy-Barman et al., 1998; Sharma et al., 2000; Cave et al., 2003). It was shown that the main sources for Os and Re in submarine hydrothermal systems are seawater, rocks of hosted oceanic crust (sediments, basalts, hyperbasites), hydrothermal fluid and extraterrestrial dust. But, the data about pristine plume component with prominent mantle-like signatures are very limited (Cave et al., 2003; Sharma et al., 2000). The main goal of our investigation was to determine the variation of Os isotope composition of different sulfide ores developed within ultramafic-hosted (12°45'N, MAR) modern hydrothermal field in order to find out the true significance of this source in the process of oceanic ore formation. The samples used in the study represent different kind of primary (high-temperature) and secondary (low-temperature) mainly copper sulfide ores with minerals such as chalcopyrite, bornite, isocubanite, covellite, chalcocite, digenite, atacamite, pyrite and sphalerite, and host mafic-ultramafic rocks as well.

The studied samples of host rocks are characterized by wide variations of Re, Os content and Os isotope composition. Thus for peridotites of different degree of hydrothermal alteration it is following $^{187}\text{Os}/^{188}\text{Os}$ - from 0.12339 up to 0.56637, Os content from 3 ppt to 1.5 ppb, and Re - from 30 ppt to 2.4 ppb. At the same time, there is no direct correlation between Os isotope composition and hydrothermal alteration of the studied rocks. Sulfide ores demonstrate even more variable isotope composition - thus the less radiogenic show isotope composition comparable with the same for the

peridotite $^{187}\text{Os}/^{188}\text{Os} = 0.22613\text{-}0.24129$, but the most radiogenic ores show such isotope composition which is higher than for the sea water $^{187}\text{Os}/^{188}\text{Os} = 1.50091\text{-}1.97094$. Partly such different isotope composition for ore could be connected with the peculiarities of mineralogical features of the studied samples – close intergrowth of primary and secondary sulfide minerals and oxide phases even for massive ores doesn't allow to evaluate the influence of sea water directly. At the same time, it is obvious that any simple model of two (seawater-host rocks) component mixing cannot explain the observed variations of Os isotope composition and content for the studied samples.

Analysis of the data obtained by the previous isotope studies (Fouquet et al., 1993, 1996, 2001; Ravizza et al., 1996; Brüggemann et al., 1998; Cave et al. 2003; our data etc.) of ores and underlying basalts and hyperbasites at the ore occurrences of TAG, Snake Pit, Logatchev, Rainbow bring to the conclusion that of polygenetic character of metal sources in the ores. It is possible, that some part of metals is being leached out of the rocks but the main source is represented by deep fluids which are at their most activity in the zones with unstable geodynamics and contrasting magmatism, higher permeability of lithosphere and decomposition of the mantle substance. The obtained isotope segmentation (Dupre, Allègre, 1980; Shirey et al., 1987; Schiano et al., 1997; Dosso et al., 1999; White, Schilling, 1978; etc.) proves heterogeneity of mantle sources and the presence of crust material (probably continental) in them (Ozima et al., 1976; Melson et al., 1972; Pilot et al., 1998) which could be explain some extraordinary Os composition in our studied samples.

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