

Geochemical characteristics of sediments and massive sulfides from sediment-hosted hydrothermal systems at South Okinawa Trough

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The hydrothermal systems of South Okinawa Trough develop at the sediment-rich continental margin with their fluid affected by fluid-sediment interaction, such as containing high CO₂ due to the thermal decomposition of organic matter in sediments; and the chemical compositions of hydrothermal deposits/precipitations may subsequently be modified. Here, we reported the geochemical characteristics of sediments and massive sulfide ores collected from the Geolin Mounds (GLM), Penglai Fault Zone (PFZ), and Mienhua Volcano (MHV) hydrothermal field at South Okinawa Trough. In addition to gas flames captured by EK60, unique geochemical features in pore water (high ³He/⁴He values and strongly Mg²⁺ consumption with depth) and hydrothermal massive sulfides on the seafloor have confirmed their vigorous hydrothermal activities. At GLM and PFZ sites, sediments related to hydrothermal alteration were found at few specific layers with significant enrichments of Au, Ag, As, Bi, Cu, Cd, Pb, Sb, Sn and Zn as well as low-/very low-sulfidation minerals, such as pyrrhotite, sphalerite, and galena etc. The positive relationships of Au, Ag, As, Bi, Cu, Cd, Pb, Sb, Sn and Zn with Ag preliminarily indicated hydrothermally enriched metal elements. Massive sulfides collected from GLM, MHV and PFZ sites are characterized by extreme enrichments of Ag, As, Bi, Cu, Cd, Pb, Sb, Sn and Zn. They showed similar patterns with sulphide-rich and sulphate-rich ore deposits collected from the Mid-Okinawa Trough and East Pacific Rise sulfide deposits except for slightly enriched Sn and depleted Ni. The geochemical characteristics observed at South Okinawa Trough might reflect the influence of hydrothermal fluid-sediment interaction on hydrothermal mineralization.