HYDROTHERMAL FLUID EVOLUTION AND ORE-FORMING PROCESSES OF SUBMARINE HYDROTHERMAL SYSTEMS IN THE OKINAWA TROUGH

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The Okinawa trough is a backarc-spreading basin featuring emitting hydrothermal solutions (black chimneys) and modern sulfide precipitation on the sea floor. The study of fluid inclusions in the water-rock interaction products in JADE hydrothermal active field shows that the deep hydrothermal systems are extremely rich in gas and there are two independent and coexisting fluids: CO2-hydrocarbon and saline fluids. Microthermometry and Laser Raman Microprobe demonstrate that the fluid inclusions are dominated by CO2 with minor CH4, C2H4, C2H6, N2, H2S etc., similar to the fluid inclusion composition of natural gas field. The saline fluid is close to H2O-NaCl or H2O-NaCl-KCl system and with a salinity of from 3.7 to 7.5% NaCl eq. Before the venting on seafloor, the fluids of different source mix and immiscibilityly separate. One of the end-member fluids for mixing was seawater circulated downwards and interacted with sub-seafloor rocks. The other was gas (volatile)-rich fluid derived from magma chamber of shallow emplacement. The immiscibility separation of fluids resulted from the decrease of temperature and pressure of hydrothermal system and continuous input of magma volatile. The saline fluid in deep submarine hydrothermal system is emitted as black chimneys on the seafloor, while CO2-rich fluid is discharged as CO2 bubbles through CO2 hydrate pipes. A large amount of CO2-CH4-H2S gases or fluids in the upper part of hydrothermal system and reaction of this gas or fluid with saline fluids finally will lead to the industrial accumulation of metal sulfides.