

Strontium and sulfur isotopic study of barite from sediment beneath active hydrothermal fields in the mid-Okinawa Trough

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Barite is common sulfate mineral recognized in seafloor hydrothermal deposits. Based on its chemical formula BaSO_4 , barite is considered precipitates by mixing of Ba-bearing hydrothermal fluid and SO_4 -bearing seawater. Therefore, isotopic compositions of Sr that replaces Ba and of S of sulfate would provide constraint on geological environment where the mixing process causes barite formation. We have studied barite in sediment cores obtained during scientific drilling campaigns conducted in the Okinawa Trough by J-MARES (Research and Development Partnership for Next Generation Technology of Marine Resources Survey). By the drilling, sediment cores up to several tens meters were recovered from subseafloor region beneath hydrothermal fields where active hydrothermal vents were observed in the neighborhood. Occurrence of barite was recognized in specific layers around a few meters or several tens meters below the seafloor. We compared Sr and S isotopic compositions of the subseafloor barite in sediment with barite occurred in hydrothermal chimneys or hydrothermal mound above the seafloor of the same hydrothermal field. The seafloor barite showed a narrow range of isotope ratio both in Sr and S, which suggests simple mixing process above the seafloor. On the other hand, the subseafloor barite showed Sr isotope ratios range from the seawater value to the value recognized in the seafloor barite, and S isotope ratios from the seawater sulfate value to slightly heavier (^{34}S -rich) value. These results suggest the subseafloor barite precipitates in the environment distinctive from the hydrothermal chimney or mound. While the seafloor barite precipitates in a kind of open system, the subseafloor barite is likely to precipitate in closed environment such as in pore space of sediment. Especially, ^{34}S -rich signature of sulfate would suggest that barite precipitates in environment where seawater sulfate partially reduced to sulfide.