

海底熱水循環系の生物地球化学的理解に向けた 実験的アプローチ

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Experimental Approach to Obtain a Comprehensive Understanding of the Biogeochemistry of a Seafloor Hydrothermal System

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Abstract

High-pressure and high-temperature hydrothermal experiments were initially conducted to measure mineral solubility and growth rate. Since then, considerable efforts have been made to characterize the alteration assemblages produced by a wide variety of hydrothermal fluids in different rock types. Based on such information, the conditions of sub-sea floor hydrothermal systems and the formation processes of ore deposits were investigated. These studies significantly depended on many important experimental results obtained by a batch (closed)-type experimental system which gives equilibrium conditions. On the other hand, attention has been also paid to a flow-type experimental system, because natural systems can not only be constrained by experiments under equilibrium conditions but, more importantly, by non-equilibrium experiments. Recently, hydrothermal experiments were carried out to better understand interactions among rocks, hydrothermal fluids, and microbes. It has been suggested that microbial ecosystems might be widely distributed within oceanic crusts and be sustained by chemical energy derived from water-rock interactions. However, little is known about the flux of energy and materials involved in microbial activity within the crustal aquifer because of technical difficulties in accessing sub-seafloor environments. A flow-type cultivation system simulating natural hydrothermal environments including crustal aquifers could provide insights into the ecological significance of microorganisms and their contribution to the biogeochemical cycle in global oceans and crusts.

Key words : hydrothermal experiment, batch reactor, flow-through apparatus, microbial ecosystem, water-rock interaction, deep-sea hydrothermal system

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