

Amino acid in deep-sea hydrothermal sub-vent and its stereo chemistry for organic geochemical studies

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Introduction

International research project on interaction between sub-vent biosphere and geo-environment at Suiyo seamount, Izu-bonin arc, Pacific ocean have been being investigated. Since the discovery of Galapagos submarine hot spring, deep-sea hydrothermal systems have been proposed to be possible environments for chemical evolution and the origins of life on Earth. So far number of particular submarine ecological colonies have been recognized near black or clear smokers and its organic rich seafloor mat. Recently, ocean drilling projects on submarine hydrothermal vent started to explore subjacent frontier of biosphere, which was named Archaean Park Project (Urabe, 2001). Amino acids are common essential components of all terrestrial organisms. Here we studied the vertical distribution of amino acids and their stereo chemistry in the core samples which was collected in such extreme environments as at 308 C and 15 MPa.

Experimental

Deep-sea hydrothermal sub-vent boring core samples were collected in the Archaean Park Project Cruise for Suiyo seamount, Pacific Ocean (28.33N, 140.39E). Amino acids were extracted from the core samples, hydrolyzed, and determined by ion exchange HPLC. D/L ratio of the amino acids was measured by reversed-phase HPLC after pre-column derivatization with o-phthalaldehyde and N-acetyl-L-cystein.

Result and discussion

Total hydrolyzed amino acids in APSK 05 ranged from 30 to 100 nmol/g-rock. The vertical concentration showed positive correlation with total organic carbon. Vertical distribution of amino acid concentration, D/L ratio of amino acids and phosphatase activity supported the presence of subjacent vigorous microbial new oasis, which was also suggested by microbiological studies of the core samples. Signatures for the abiotically-formed amino acids, such as high D/L ratio and predominance of w-amino acids [2] were not observed. It is suggested that terrestrial habitable zone is widespread below submarine hydrothermal vent areas.

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