

Organic matter in the 2.7Ga submarine volcanic rocks altered by hydrothermal activity: Archean Subsurface Biosphere?

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Submarine hydrothermal system on the Archean seafloor is becoming the favorable environments for origin of life. This hypothesis is supported by many investigators, but geological evidence is very poor. Investigation of the relationship between submarine hydrothermal and biological activities is the main purpose of this study. Submarine volcanic rocks altered by contemporary hydrothermal activities are studied.

The remarkable point of the examined rocks is the occurrence of organic matter (0.01 to 0.02 wt%). These organic matter derived from: (1) bacteria lived in the crust where hydrothermal fluids circulated; (2) inorganic graphite from volcanic gases (CO₂, CH₄) and; (3) marine microorganism carried by the circulation sea water. Carbon isotope compositions of these organic matter range from -21.2 to -17.7 per mill and such range fit to the compositions of chemoautotrophs. The case (1) is strongly suggested by these isotope data. Sulfur isotope compositions range from -10.8 to +14.3 per mill. These data indicate that: (4) sulfides in the examined rocks were formed by inorganic sulfate reduction or; (5) by bacterial sulfate reduction.