

Reproduction of primitive metabolic pathways on the iron sulfide surface with electricity

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Deep-sea hydrothermal vent is one of the candidates for the place of origin of life. It is proposed that sulfide minerals forming vent chimneys gives suitable organic reaction fields for prebiotic chemical evolutions. We have showed that electricity is generated through deep-sea hydrothermal chimney wall. It is expected that the electricity influenced to the chemical evolutions on the hydrothermal vent chimneys. In this work, we experimented the electrical reductions of some organic acids, those are intermediates in the tricarboxylic acid cycle. Negative electric potential were applied to iron sulfide electrode in the solution containing organic acid, and reduced products were observed. This result shows that electricity through the chimney wall on a hydrothermal vent can motive parts of the reductive tricarboxylic acid cycle. It was suggested that electricity generation on the deep-sea hydrothermal vent promoted the chemical evolution of primitive carbon metabolic pathways.