

The relationship between microbial sulfur isotope fractionation and temperature

Fumihiko Matsuura[1]

[1] Earth and Planetary Science, Tokyo Univ

Sulfate reducing is one of the processes to get energy for microorganisms. They use hydrogen or organic substrates for electron donor and sulfates for electron acceptor, and reduce sulfates to sulfides. Sulfate reducing bacteria belongs both archeobacteria and bacteria, and they said its the oldest bacteria in the world (Shen 2004) .

The origin of sulfur around the hydrothermal vent is speculated by the isotope ratio of sulfur, especially the light sulfur under -30 permil is supposed to be made by sulfate reducing bacteria. But at the laboratory experiment , sulfate reducers do not make so light sulfur, so many models were made to explain the light sulfur.

Canfield et al (2006) suggested standard model that is the model of relationship between sulfur isotope fractionation and temperature. My study is to verify standard model , so I performed laboratory experiment using *Desulfovibrio desulfuricans* sulfate reducing bacteria.

[Method]

I measured sulfur isotope fractionation on sulfate and sulfide using ICP-MASS, considering time scale. The experiment performed at (25 , 30 , 37),degree to test the dependency of isotope fractionation on temperature.

[Results and Discussion]

The results of my experiment was different from the results derived from standard model.

First , standard model suggest sulfur isotope fractionation is inverse proportion to the rate of sulfate reduction. And rates of sulfate reduction is proportion to temperature within 25 to 37 degree. But my results have peak at 30 degree, fractionation at 37 degree is smaller than 30 degree.

Second samples were collected at 12 hours intervals, and it allows considering sulfur isotope fractionation change by time scale. That was never done before. Result was that changing pattern of fractionation at 25 degree was different from the pattern of 30 degree and 37 degree.

Especially changing of produced sulfides isotope ratio was different. At the time of 25 degree sulfate and sulfides sulfur isotope ratio gets heavier, while the ratio of sulfides sulfur isotope ratio does not change, even get lighter.

The discussion is that why such difference has made, and my suggestion is 25 degree is low for microorganisms enough to make isotope equilibrium , but 30 degree and 37 degree is too high to make isotope equilibrium. that is two patterns of relationship isotope fractionation and temperature.