Geophysical Research Abstracts
Vol. 12, EGU2010-8717, 2010
EGU General Assembly 2010

On-line Sulfur Isotope Determination by Hydride Generation coupled to MC-ICP-MS

Nolwenn Callac (1), Olivier Rouxel (2,3), Emmanuel Ponzevera (4), and Anne Godfroy (1)

(1) Laboratoire de Microbiologie des Environements Extremes, UMR 6197, IFREMER, 29280 Plouzané, France , (2) Woods Hole Oceanographic Institution, Marine Chemistry & Geochemistry, Woods Hole, MA02543, USA, (3) IUEM, Université de Bretagne Occidentale, 29280 Plouzané, FRANCE, (4) IFREMER, Département Géosciences Marines, 29280 Plouzané, FRANCE

In seafloor hydrothermal systems, Sulfur is an important element present in various forms such as sulfate, elemental sulfur or sulfide in hydrothermal fluids and pore waters. Sulfur, as either electron donor or acceptor, is one element that enables support for microbial life in the deep biosphere. Traditionally, measurements of $^{34}S/^{32}S$ ratios ($\delta^{34}S$) are performed using gas-source mass spectrometry (GS-MS) in which sulfur is introduced as gaseous SO_2 or SF_6 species. We recently developed an alternate technique for the accurate and precise determination of $^{34}S/^{32}S$ ratios in sulfur-bearing minerals using solution and laser ablation multiple-collector inductively coupled plasma mass spectrometry (MC-ICP-MS) (*Craddock et al, 2008; Chemical Geology 253 p102–113*). We examined and determined rigorous corrections for analytical difficulties such as instrumental mass bias, unresolved isobaric interferences, blanks, and laser ablation- and matrix-induced isotopic fractionation. In particular, the use of high resolution sector-field mass spectrometry has been shown to remove major isobaric interferences from O_2^+ while standard–sample bracketing allowed the correcting instrumental mass bias of unknown samples.

Here, we evaluate a new method for the direct determination of S isotope in environmental samples using on-line generation of hydrogen sulfide coupled to MC-ICPMS. It is expected that the introduction of volatile S-species in the plasma torch will lower the minimum amounts of S required per analysis by more than 1 order of magnitude while permitting matrix-free isotope analysis. An important aim of this study was to determine optimal procedures to overcome analytical difficulties such as instrumental mass bias, unresolved isobaric interferences, blanks, and isotope fractionation induced during hydrogen sulfide generation. We initially applied this method to investigate the diversity of sulfur isotope fractionations during microbial sulfur-reducing or sulfate-reducing at high temperature. For that purpose, we used pure hyperthermophilic strains isolated from deep-sea hydrothermal vents, including several sulfur- and sulfate-reducing archaea strains and sulfate-reducing strains. These results will be discussed according to the source of sulfide, the temperature of incubation, and type of microbial strains.