Spatio-temporal variability in diffuse hydrothermal vent fluids – Implications on biogeochemical processes

F. WENZHÖFER, H. RØY AND J. FELDEN

Max Planck Institute for Marine Microbiology, Bremen, Germany, (fwenzhoe@mpi-bremen.de)

The emission of hydrothermal fluids into the ambient seawater leads to steep physico-chemical gradients which can strongly vary over space and time. The greatly varying chemical conditions and the often very steep chemical gradients, generate a wide range of geochemical niches and potential energy sources for (micro-)organisms. An understanding of variability of vent fluids is a prerequisite for understanding the distribution and activity patterns of organisms and thus the interplay between biotic and abiotic process at hydrothermal habitats. To measure at the scale relevant for the vent organisms, high resolution in situ measurements are required to precisely characterize gradients of temperature, O_2, pH, sulfide and hydrogen. From these measurements microhabitat structures can be identified and they provide invaluable information on how hydrothermal habitats evolve and how vent organisms maintain their energy requirements.

Here we report on studies investigating the physico-chemical gradients of diffuse vent fluids at the Logatchev vent field (14°45'N). In situ microsensor measurements of O_2, H_2S, T and H_2 were used to investigate the links between the geochemical energy supply from hydrothermal fluids and hydrothermal vent communities. Microsensor time records show a highly fluctuating signal over time. At occasions where warmer fluids pour out electrode signals of H_2S and H_2 increased while O_2 electrodes showed a distinct reduction. This shows that beside methane also sulfide and hydrogen are available as an energy source for both free-living and symbiotic sulfur-oxidizing bacteria. Also, the maximum signal change varied spatially within the same mussel field on a distance of a few decimeters.

This work is carried out in the framework of the German DFG-Priority Program SPP1144 “From mantle to ocean”.

Major, minor and trace element analyses with XRF using synthetic standards

JÜRGEN WESS

(juergen.wess@panalytical.com)

X-ray fluorescence spectrometry is used extensively for geochemical analyses. Simple sample preparation, high accuracy and precision, and a good to excellent detection limits across large parts of the periodic table are the principal reasons for this choice.

Major, minor and trace element analyses are possible with respect to the task of the examination.

Accurate quantification requires accurate spectrally clean net peak intensities, accurate corrections for inter-element matrix effects and good standards either for wide range oxide major and minor concentrations as well for trace element analyses.

For major and minor concentrations a fused bead sample preparation is recommended for various reasons. Together with a set of synthetic standards (in collaboration with the British Geological Survey) 21 elements can be covered up to very high concentrations. Based on advanced FP algorithms a very good accuracy and precision can be achieved from ores, soils to technical minerals.

For accurate quantification of traces close to their detection limits a different approach is needed. Using, carefully designed, interference free, pressed powder standards, accurate background intensities are determined. Spectral line overlap factors, for both peak and backgrounds are iteratively calculated. Further corrections for tube spectral impurities are possible. Calibrated based on the corrections of mass absorption coefficients no major concentrations have to be known.

The combination of advanced algorithms with superior standards makes the analyses of traces a routine type of work.