Interface Science - Hydrospheric Environment Analysis -

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Visitor

Dr Rudolf Durny Slovak Technical University, Slovakia, 1 December 2000

Scope of Research

Research activities are concerned with geochemistry, oceanography, limnology and analytical chemistry, which are important basic sciences in order to realize the sustainable society. Major research subjects are as follows: (i) Biogeochemistry of trace elements in the hydrosphere. (ii) Hydrothermal activity and deep biosphere on the ocean floor. (iii) Fe-uptake mechanism of phytoplankton. (iv) Ion recognition. (v) Simulation of non-linear chemical reaction.

Research Activities (Year 2001)

Presentations

Determination of trace metals in the ocean by MAF-8HQ column extraction-ICP-MS, Sohrin Y, Kinugasa M, Okamura K, et al., International Congress on Analytical Sciences 2001, 8 August.

Determination of $^{240}Pu/^{239}Pu$ ratio in the ocean by using HR-ICP-MS, Norisuye K, Okamura K, Sohrin Y, et al., International Congress on Analytical Sciences 2001, 8 August.

Separation of transition metals with poly-(pyrazolyl)borates by solvent extraction technique, Kitano T, Wada H (Kanazawa U.), Mukai H (Kyoto U. Educ.), et al., International Congress on Analytical Sciences 2001, 8 August.

The pursuit of siderophore secreted by marine phytoplankton *Rhodomonas ovaris*, Naito K, Suzuki M, Mito S, et al., International Congress on Analytical Sciences 2001, 10 August.

Steric control of selectivity in metal ion-selective membrane electrode based on polypyrazolylmethanes, Yoshimoto S, Mukai H (Kyoto U. Educ.), Sohrin Y, International Congress on Analytical Sciences 2001, 10 August.

Novel acylpyrazolones having crown ether moiety as intramolecular synergist, Umetani S, Ogura K (Ube Nat. C. Tech.), Yamazaki S (Nara U. Educ.), International Congress on Analytical Sciences 2001, 10 August.

Grants

Sohrin Y, Dynamics of trace bioelements in the ocean and its effect on ecosystem, Grant-in-Aid for Scientific Research (B) (1), 1 April 2001 - 31 March 2004.

Umetani S, Design of highly selective recognition and separation system of metal ions, Grant-in-Aid for Scientific Research (C) (1), 1 April 2001 - 31 March 2003.

Okamura K, Development of *in situ* measurment system of CO_2 related matter in seawater for gloval warming control, NEDO Grant, 1 April 2001 - 31 March 2004.

Topics

Development of a deep-sea *in situ* Mn analyzer and its application for hydrothermal plume observation

This paper [1] presents the first *in situ* flow-through chemical analyzer using a chemiluminescence (CL) method in the deep sea to a depth of 5,200 m. The analyzer, called GAMOS (Geochemical Anomalies MOnitoring System), successfully determines concentration of dissolved manganese continuously *in situ* using a H_2O_2-luminol CL method. A detection limit of 0.23 nM was obtained. Continuous measurements of manganese performed *in situ* with the GAMOS in a hydrothermal vent plume yielded high-resolution chemical data in near real time. This detection capability will provide a more representative sampling of hydrothermal plumes over larger concentration ranges than have been possible using most previous methods and instrumentation.

1. K. Okamura, H. Kimoto, K. Saeki, J. Ishibashi, H. Obata, M. Maruo, T. Gamo, E. Nakayama and Y. Nozaki, *Mar. Chem.*, **76**, 17-26 (2001).

Figure 1. The *in situ* chemical analyzer GAMOS attached on the submersibel "Shinkai 6500"

Distribution of trace bioelements in the subarctic North Pacific Ocean and the Bering Sea (the R/V Hakuho-Maru Cruise KH-97-2)

A column concentration-high resolution ICP-MS determination was applied to measuring the total dissolved concentrations of Fe, Co, Ni, Cu and Zn in seawater collected from the subarctic North Pacific (~45ºN) and the Bering Sea in July–September [2]. The vertical profiles for Fe, Ni and Zn were nutrient-like. The deep water concentration of Fe was ~0.5 nM in the northeast Pacific and increased to ~1 nM in the northwest Pacific and ~2 nM in the Bering Sea. The deep water concentrations for Ni and Zn in the Bering Sea were also 1.3–2 times higher than in the North Pacific. Fe and Zn were depleted in surface water of the subarctic North Pacific. The relationship between these trace elements and nutrients suggests that these elements could be a limiting factor of phytoplankton productivity. In the Bering Sea, surface water contained ~0.3 nM of Fe. The Zn concentration, which was less than the detection limit in surface water, increased at shallower depths (~30 m) compared with the subarctic North Pacific. These results imply a higher flux of Fe and Zn to surface water in the Bering Sea. This in turn may cause the Bering ecosystem characterized by a dominance of diatoms and high regenerated production.

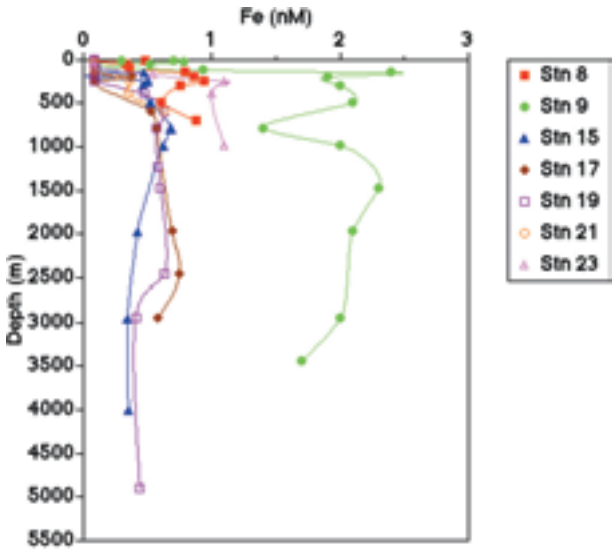

Figure 2. Vertical profiles of dissolved Fe in the Bering Sea (Stn. 8 and 9) and the subarctic North Pacific (Stn. 15-23).

2. Y. Fujishima, K. Ueda, M. Maruo, E. Nakayama, C. Tokutome, H. Hasegawa, M. Matsui and Y. Sohrin, *J. Oceanogr.*, **57**, 261-273 (2001).

Award

Okamura K, The ICR Award for Young Scientists.