Noble gases and nitrogen in the Isheyevo CH/CB chondrite

D. NAKASHIMA[1,2], S. P. SCHWENZER[1] AND U. OTT[1]

[1]Max-Planck-Institut für Chemie, Mainz, Germany (ott@mpch-mainz.mpg.de)
[2]University of Tokyo, Tokyo, Japan (naka@eqchem.s.u-tokyo.ac.jp)

Metal-rich CH and CB carbonaceous chondrites are known to show characteristic noble gas signatures and nitrogen isotopic compositions [e.g., 1-2]. Noble gases in CHs and CBs are characterized by Ar-rich gases and low $^{136}Xe/^{132}Xe$ ratios (solar wind-Xe like) [1]. In addition, these chondrites have the isotopically heaviest N in chondrites ($\delta^{15}N \sim +1000‰$; [2]). In this study, we analyzed noble gases and nitrogen in magnetic fraction (MF) and non-magnetic fraction (NMF) from Isheyevo, which is an unique meteorite consisting of CH-like and CB-like lithologies [3].

Isotopic ratios of He and Ne show that light noble gases in both fractions are dominated by solar and cosmogenic noble gases. Trapped $^{4}He/^{20}Ne$ ratios are about 400 for MF and 170 for NMF, indicative of high retentivity of solar noble gases in MF. Trapped $^{20}Ne/^{36}Ar$ ratio of MF (~5) is lower than that of NMF (28). This can not be explained by preferential loss of solar ^{20}Ne, because of higher retentivity of solar noble gases in MF. It is likely that the low $^{20}Ne/^{36}Ar$ ratio is due to enrichment of ^{36}Ar, i.e., Ar-rich noble gases, which are considered to be fractionated solar wind noble gases [e.g., 4]. In the case of Ishyevo, Ar-rich gases appear to be concentrated in metallic phases (MF).

Xe isotopic ratios in NMF are almost identical to Xe-Q, whereas Xe in MF seems to be the mixture of Q-Xe and solar wind-Xe (SW-Xe). This indicates that SW-Xe is contained in MF. Since MF contains both solar and Ar-rich gases, it is not clear whether SW-Xe is associated with solar or Ar-rich gases.

Nitrogen in MF ($\delta^{15}N = +1230‰$) is isotopically heavier than that in NMF (+310‰). Nitrogen in NMF may be diluted with isotopically "normal" nitrogen (0±50‰; [5]).

Acknowledgement

We thank M. A. Ivanova for providing magnetic and non-magnetic fractions of the Isheyevo meteorite.

References

[1] Lewis R. S. (1985) *Meteoritics* **20**, 689.
[2] Prombo C. A. and Clayton R. N. (1985) *Science* **230**, 935-937.
[3] Ivanova M. A. (2006) *LPS***XXXVII**, Abstract#1100.
[4] Nakamura T. *et al*. (2003) *MAPS* **38**, 243-250.
[5] Grady M. M. and Pillinger C. T. (1990) *EPSL* **97**, 29-40.

Physicochemical speciation of trace metals during the mesoscale iron enrichment (SEEDS II) in the western North Pacific

S. NAKATSUKA[1]*, Y. SOHRIN[1], K. NORISUYE[1], K. OKAMURA[2], S. TAKEDA[3] AND J. NISHIOKA[4]

[1]Institute for Chemical Research, Kyoto University, Kyoto, Japan (nakatuka@inter3.kuicr.kyoto-u.ac.jp)
[2]Center for Advanced Core Research, Kochi University, Kochi, Japan
[3]Graduate School of Agricultural and Life Sciences, The University of Tokyo, Tokyo, Japan
[4]Institute of Low temperature Science, Hokkaido University, Hokkaido, Japan

The mesoscale iron-enrichment experiment SEEDS II was conducted near the edge of the subarctic Western Notrh Pacific gyre, where SEEDS I had been carried out [1, 2]. We investigated dissolved and particulate Co, Ni, Cu, Zn, Cd and Pb in seawater from both field observation for 26 days and shipboard incubation with a natural phytoplankton assemblage for 10 days. Discrete seawater samples were filtered through 0.2 µm filter and acidified to pH 2.2 for the determination of the dissolved species by ICP-MS. The filter was used to measure the particulate species by FI-ICP-MS.

Before the iron enrichment, the average concentrations for dissolved Co, Ni, Cu, Zn, Cd and Pb in the surface mixed layer (0-20 m) were 70 pM, 4.9 nM, 2.1 nM, 1.6 nM, 0.48 nM and 52 pM, respectively, and those for the particulate species were 1.7 pM, 0.052 nM, 0.094 nM, 0.46 nM, 0.037 nM and 5.2 pM, respectively. After the enrichment, there was a threefold increase in chlorophyll *a* (~3 µg/L) by day 12. However, there was no detectable difference in the dissolved and particulate trace metals between inside and outside the patch. In the shipboard incubation, addition of 1 nM Fe caused a 30-fold increase in chlorophyll *a* (~9 µg/L) dominated by *Pseudo-nitzschia sp*. and increases in the particulate trace metal fraction up to 3-45%. These results suggest that Fe was a limiting factor for the growth of phytoplankton. In addition, enhanced-grazing by mesozooplankton presumably limited the growth of phytoplankton and the transformation of trace metal speciation during the mesoscale Fe enrichment.

References

[1] Tsuda *et al*., (2003), *Science*, **300**, 958.
[2] Kinugasa *et al*., (2005), *Prog. Oceanogr*., **64,** 129.