6.3.P05

Laboratory experiments on the effect of aqueous alteration on noble gases in the Allende CV3 chondrite

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It should very important to examine what kind of roles water played on the parent bodies of meteorites. It is likely that carbonaceous chondrites have experienced aqueous alteration and that water gave effects on the textual, mineralogical and compositional variations [1]. Previously, we examined the effect of aqueous alteration on the noble gases, but the retentivities of various phases containing noble gases were still unclear [2]. In this study we have carried out the experiments to examine the effect of aqueous alteration on various noble gas carries by changing the alteration period.

We sealed Allende CV3 chondrite into a pressure vessel with pure water and kept it at 200º C for two and four weeks. The concentrations of noble gases have been measured in four temperature steps by VG5400 in Osaka university. The noble gas concentrations decreased in these two samples compared to those in the starting sample, and the degree of decreasing is large in the sample treated for two weeks (HM-2) compared to that for four weeks (HM-4). The release temperature of noble gases seemed to be shifted to the lower temperature in HM-4. These results suggest that the aqueous alteration surely affects the retentivity of noble gases in meteorites.

We decomposed the various components of noble gases and examined the difference of retentivity of noble gases in these host phases. There was no significant effect on HL component, but Q, radiogenic, and cosmogenic components lost their gases, respectively. The degree of loss is the lowest in Q, and the highest in the cosmogenic component. The Q is less resistant than HL component against the aqueous alteration, which is just opposite to that reported for the thermal metamorphism where Q is more resistant than HL component [3].

References

[1] e.g. DuFresne E.R. and Ander E. (1962) *GCA* **26**, 1085-1114.
[2] Nakasyo E., Maruoka T., Matsumoto T and Matsuda (1999) *Antarct. Meteorite Res.* **13,** 135-144
[3] Huss G. R., Lewis R. S. and Hemkin S. (1996) *GCA* **60**, 3311-3340.

6.3.P06

A XAFS study of carbonaceous macromolecular matter in carbonaceous chondrites

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Introduction

Recently, X-ray absorption fine structure (XAFS) spectroscopy has been applied to the characterization of some extraterrestrial carbonaceous materials [1, 2, 3]. The carbonaceous matter in carbonaceous chondrite has sulfur heterocycles such as thiophene [4]. We observed sulfur K-edge XAFS spectra of the carbonaceous matter and tried to evaluate the degrees of thermal metamorphism and/or aqueous alteration in their parent bodies.

Samples and method

Measurement was performed at the High Energy Accerelator Research Organization (KEK). Powdered samples were pressed onto stainless plates, and the plates were set in the chamber at the beamline BL-11B. Spectra were obtained by TEY (total electron yield) method. 15 chondrites (13 CM, 1 CV and 1 CO) were examined. The result of some samples was previously reported [5].

Results and discussion

The spectra of CM chondrites show sulfidic, sulfate and thiophenic absorptions. The chondrites experienced thermal metamorphism strongly can be distinguished by relatively weak thiophenic absorption from the unheated or weakly heated CM chondrites. This suggests that the thiophenic portion of the carbonaceous matter must be gradually lost during thermal metamorphism. The CV (Allende) and CO (Ornans) chondrite did not show thiophenic and sulfate absorptions.

References

[1] Cody G. D. III, Alexander C. M. O'D and Tera F. (1999) *Meterorit. Planet. Sci.* **34,** A25-A26.
[2] Keller L. P., Messenger S., Flynn G. J., Jacobsen C. and Wirick S. (2000) *Meterorit. Planet. Sci.* **35,** A86.
[3] Derenne S., Behar F., Robert F., Rouzaud J.-N., Gourier D. and Largeau C. (2001) *Meterorit. Planet. Sci.* **36,** A49.
[4] Shimoyama A. and Katsumata H. (2001) *Chem. Lett.* 202-203.
[5] Kitajima F., Kitajima Y., Nakamura T. and Mase K. (2003) *Meterorit. Planet. Sci.* **38,** A114.