

IRON MICRO-XANES ANALYSIS OF MARTIAN KAERSUTITES. A. Monkawa, T. Mikouchi, E. Koizumi, J. Chokai, K. Sugiyama, M. Miyamoto, Dept. Earth & Planetary Sci., University of Tokyo, Tokyo, Japan. E-mail: monkawa@eps.s.u-tokyo.ac.jp.

Introduction: Some martian meteorites are known to contain hydrous minerals such as kaersutite [1-3]. The presence of kaersutite has been considered to indicate significant quantities of water in the pre-eruptive magmas [4] because kaersutites are present only in magmatic inclusions. However, this evidence is inconclusive because martian kaersutites are H-poor [5]. The $\text{Fe}^{3+}/\Sigma\text{Fe}$ ratio of H-poor kaersutites in terrestrial rocks are usually higher than that of normal amphibole groups. This can be explained by oxidation-dehydrogenation in terrestrial kaersutites. Thus, the H content of martian kaersutite may also have decreased by such oxidation-dehydrogenation. To elucidate the formation of low-H kaersutites in martian meteorites, it is necessary to determine their $\text{Fe}^{3+}/\Sigma\text{Fe}$ ratios. We analyzed the $\text{Fe}^{3+}/\Sigma\text{Fe}$ ratio by using synchrotron micro-XANES analysis.

Analytical method: Fe-XANES spectra were recorded in fluorescence mode on Beamline 4A at the 2.5 GeV Photon Factory (KEK, Tsukuba, Japan) using bending magnet radiation. Kirkpatrick-Baez geometry mirrors were used to focus the beam to a 5 x 5 μm spot on the specimen. The transmitted and fluorescent X-rays were measured by an ionization chamber and a Si (Li) detector, respectively. We prepared a calibration line for martian kaersutites on the basis of XANES pre-edge positions in spectra of standard kaersutites whose Fe^{3+} contents were determined by wet chemistry. By using this calibration line, we measured Fe-XANES spectra of martian kaersutites (Chassigny, Zagami and LEW88516).

Results and Discussions: XANES pre-edges of kaersutites in both Chassigny and LEW88516 are located at almost the same position as standard kaersutite whose $\text{Fe}^{3+}/\Sigma\text{Fe}$ ratio is 0, suggesting that the Fe^{3+} contents of these martian kaersutites are low, and that oxidation-dehydrogenation is not responsible for low-H contents of these martian kaersutites. In contrast, the XANES pre-edge position of Zagami kaersutite is closer to that of standard kaersutite whose $\text{Fe}^{3+}/\Sigma\text{Fe}$ ratio is 0.36. The H content in Zagami kaersutite may have changed by oxidation-dehydrogenation because Zagami kaersutite has a moderate amount of Fe^{3+} . However, based on the result of this study, the low H content in Zagami kaersutite can not be explained only by oxidation-dehydrogenation because the loss of H content in the kaersutite by oxidation-dehydrogenation is small. We propose that H-deficient martian kaersutites could be formed by Ti-oxy substitution rather than oxidation-dehydrogenation. XANES pre-edge positions of kaersutites depend on their crystallographic orientations [6]. In order to correct the pre-edge positions depended on different crystallographic orientation, we are planning to determine crystallographic orientations of martian kaersutites by EBSD equipped with FEG-SEM, and to measure Fe-XANES spectra of standard kaersutites at the same crystallographic orientations as martian kaersutites.

References: [1] Floran R. J. et al. 1978. *Geochimica et Cosmochimica Acta*, 42:1213-1229. [2] Treiman H. 1985. *Meteoritics*, 20:227-242. [3] Johnson M. C. et al. 1991. *Geochimica et Cosmochimica Acta*, 55:349-366. [4] McSween H. Y. and Harvey R. P. 1993. *Science* 259:1890-1892. [5] Watson L. L. et al. 1994. *Science*, 265:86-90. [6] Dyar M. D. et al. 2002. *The Canadian Mineralogist*, 40:1375-1393.