

PPS021-P04

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## U-Pb Dating and D/H Ratio of Phosphates in the Martian Meteorite ALH84001.

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The presence of water on Mars has been revealed by observations using spacecrafts, and elemental and isotopic analyses of Martian meteorites. In previous SIMS analyses of hydrogen, phosphate minerals containing OH group, for example an apatite( $\text{Ca}_5(\text{PO}_4)_3[\text{OH}, \text{F}, \text{Cl}]$ ) and a whitlockite( $\text{Ca}_9[\text{Mg}, \text{Fe}^{2+}](\text{PO}_4)_6\text{PO}_3\text{OH}$ ) were used. There are many studies that measured D/H ratios from the OH group in phosphates [1], [2]. Phosphate minerals are enriched in Uranium and U-Pb dating has been made in many studies [3]. We have measured U-Pb ages, D/H ratios and amounts of water of phosphates in the Martian meteorite, ALH84001 with a NanoSIMS. The goal of this study is to observe a secular variation of D/H ratios by Martian meteorites. Phosphate minerals in a thin section were detected by SEM-EDS and it was coated with gold films before the NanoSIMS measurement. For U-Pb dating by SIMS, primary  $\text{O}^-$  ions with a beam intensity of 10nA were used. Several points were measured in single grains of a phosphate mineral in a spot diameter of about 10 micrometer. The apatite produced from Prairie Lake called PRAP whose age was known [4] was used as a standard. This phosphate mineral crystallized about 4 billion years ago according to the U-Pb, Pb-Pb system. The age obtained in this study was consistent with those of the previous studies [3] within the experimental error. For D/H ratio measurements, primary  $\text{O}^-$  ions with a beam intensity of 1 nA were used. The spot size was about 3 micrometer. D/H ratios in a number of phosphate grains were measured. Surface water contamination could be negligibly small after the baking of the sample over night at 80 deg C under a high vacuum about  $10^{-7}$  torr. The standard apatite for water measurement was driven from Morocco and some other places. The water of the Morocco apatite was extracted by heating at 1200 deg C for an hour in a vacuum line, and the abundance was measured by a manometric method. Observed D/H ratios of ALH 84001 tended to show a mixing line between the martian heavy hydrogen and terrestrial light hydrogen. Even though it is difficult to estimate the martian end-members, the data distribution suggests that the D/H ratio is at least higher than 3000 permil. The amount of water was found to be very small. This result shows a little heavier than previous results [5]. In previous studies, U-Pb age was obtained by spot analysis of several phosphate minerals. In this study it is possible to determine the age of an individual phosphate grain with several spots. We have measured the D/H ratio of the same grain. The data reflect the water on Mars at 4.0 Ga. At the poster session I will discuss the meaning of the U-Pb age and the D/H ratio.

[1] Leshin L. A. et al.(2000) *Geophys Res. Lett.* **27** 2017-2020, [2] Greenwood J. P. et al.(2008) *Geophys Res. Lett.* **35** L05203, [3] Terada K. et al.(2003) *Meteoritics&Planet.Sci.* **38** 1697-1703, [4] Sano Y. et al.(1999) *Chem. Geol.* **153**, 171-179, [5] Sugiura N. and Hoshino M. (2000) *Meteorol. Planet. Sci* **35**, 373-380.

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