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Water contents and hydrogen isotopic compositions of phosphate minerals from LL4-6 ordinary chondrites.

YANAI, Kaori[1] ; ITOH, Shoichi[2*] ; GREENWOOD, James[3] ; RUSSELL, Sara[4] ; YURIMOTO, Hisayoshi[1]

[1]Department of Natural History Sciences, Hokkaido University, [2]Department of Earth and Planetary Sciences, Kyoto University, [3]Department of Earth and environment Sciences, Wesleyan University, [4]Department of Earth Sciences, Natural History Museum, London

The origin of water on the earth is discussed by many researcher. The hydrogen isotopic compositions of earth ' s water were also studied to discuss the origin of water for Earth, Lunar and comet through the planetary scale in the solar system [Greenwood et al., 2011]. One of siginificant possible precursor of H20 in Earth ' s orbitary could be cometary ice but it is unclear. In preliminary results, we reported the hydrogen isotopic compositions of phosphate minerals (Merrilite and apatite) from Ensisheim LL6 ordinary chondrite (OC) on 2012 at JPGU and NIPR meeting in Japan. These D/H ratio are extremely duetrium-rich value (δD ˜15000permil). In addition, Deloule and Robert (1995) also reports that the hydrogen isotopic compositions of phyllosilicate from LL3.0 Semarkona OC is D-rich (˜4000permil) and suggest the origin of this D-rich isotopic compositions come from the interstellar space or in the outer regions of the solar nebula, like cometary ice. These results suggest that, as the Itokawa S-type asteroids with Earth ' s orbitary, the heavily hydrogen isotopic compositions of LL OCs resulted from cometary ice close to the earth. However, there is no sytematic study of hydrogen isotopic compositions of LL4-6 OCs because it is difficult to estimate the planetsimal hydrogen isotopic compositions of water due to very low water contents and contamination from adsorbed water. In this study, we applied the in-situ measurement technique of water content and hydrogen isotopic compositions of phosphate minerals from LL4-6 OCs by SIMS. All D/H ratio in the phosphate minerals are D-rich (δD ˜+2000 to +25000). The D/H ratio in the phosphate minerals from LL4 Soko-Banja and LL5 Tuxtuac could be resulting from degassing of H2 during Fe-water oxidation reaction but it is difficult to apply it for those of LL6 Ensisheim and Bandong LL6. These results suggest that the origin of D-rich hydrogen isotopic compositions of LL6 phosphate mineral is resulting from extra-planetary with cometary ice beause of extremely heavily hydrogen isotopic compositions.

Keywords: Hydrogen isotope, SIMS, phosphate, apatite