REPORT OF O ISOTOPIC COMPOSITIONS OF TWO ITOKAWA PARTICLES FROM ROOM B AND MEASUREMENT PLAN FOR IN-SITU 3D-DISTRIBUTION ANALYSIS OF SOLAR WIND NOBLE GASES ON SURFACE OF ITOKAWA PARTICLES.

H. Yurimoto[1] , S. Itoh[2] and K. Bajo[2]. [1]Hokkaido University. E-mail: yuri@ep.sci.hokudai.ac.jp. [2]Kyoto University.

O isotopic composition of Room B particles: Oxygen isotopic composition is one of finger prints of asteroids linking meteorite types which are beliaved as fragments of asteroids. All Itokawa particles from Room A show a constant oxygen isotope anormaly corresponding to LL chondrites which are one chemical type of ordinaly chondrites and most frequent fall among meteorites [1]. Because asteroid Itokawa is a rubble-pile body, it is not obvious whether the body is constructed by single chondrite group. Therefore, oxygen isotopic measurement from different sites of the asteroid is important to analyze rubble-pile body structure. We measureed two itokawa particles collected from Room B, which are collected from the first tauch-down site of Hayabusa whereas Room A particles from the second tauch-down site. The paaticles named RB-QD04-0006 and -0025 are 20-30μm in size and mainly consist of olivine and plagioclase, and low-Ca pyroxene, respectively. The chemical compositions of minerals are similar to the corresponding minerals from Room A samples. The oxygen isotopic compositions are distributed in equiribrium between minerals and show $\Delta^{17}O$=0.83-1.47, which are the same signature observed in Room A samples. Therefore, rubble-pile structure of Itokawa seems to be monomict.

In-situ 3-D analysis of noble gases from surface of Itokawa particles: A unique feature of Itakawa particles are exposed intact surfaces to violent space environments. A TEM study demonstrate that solar wind particles were implanted in the surface thin layer of Itokawa particle [2]. Solar noble gasses are detected from individual particles [3]. However, spatial distribution of solar noble gases has not been determined ever from natural samples. In order to determine nano-scale 3-D distribution of solar wind particles in astromaterials, we develop a novel mass spectrometer using tunneling ionization. The development was started from 2004 at one year after launching of Hayabusa spacecraft, but was independently from the Hayabusa mission [4]. Recently, we have newly developed new generation sputtered neutral mass spectrometry capable to detect tens ppma He from ~50 nm area on solid surface [5]. This project will be figured out how distribute He (and other noble gases and H) in the surface layer of Itokawa particles with tens nm resolution. If this distribution is clarified, we can apply atomic mechanisms in solid clarified by mineralogy and crystallography, such as diffusion, partitioning, etc., to the noble gas cosmochemistry. As a result, behavior of noble gas in solid can be used to describe space environments as the same manner of trace element behavior for terrestrial environmental research. Therefore, this project is the first step to pioneer a new research field of noble gas mineralogy or noble gas astromineralogy.

References: [1] Yurimoto H et al. 2011. *Science* 333:1116–1119. [2] Noguchi T et al. 2011. *Science* 333:1121–1125. [3] Nagao K et al. 2011. *Science* 333:1128–1131. [4] Ishihara M et al. 2010, *Surf. Interface Anal.* 42: 1598-1602. [5] Ebata S et al. 2012, *Surf. Interface Anal.* 44: 635-640.