CURRENT SITUATION OF IN-SITU U-PB DATING OF ITOKAWA PARTICLES.

K. Terada[1], Y. Sano[2], N. Takahata[2], A. Ishida[2], A. Tsuchiyama[3], T. Nakamura[4], T. Noguchi[5], Y. Karouji[6], M. Uesugi[6], T. Yada[6], M. Nakabayashi[1], M. Kamioka[1], K. Fukuda[6] and H. Nagahara[6]. [1]Osaka University. E-mail: terada@ess.sci.osaka-u.ac.jp, [2]The University of Tokyo, [3]Kyoto University, [4]Tohoku University, [5]Kyushu University, [6]JAXA.

Introduction: Itokawa particles are the first regolith samples from "rubble-pile" asteroid that clearly witness multiple processes over a 4.6 billion year period. A series of elaborate studies [e.g. 1-3] have revealed that Itokawa had suffered from complex history such as (1) intense thermal metamorphism around the 800-900 degree, (2) catastrophic collision and disaggregation, (3) reaccretion onto rubble-pile asteroid, and (4) space weathering. However, the chronology of Itokawa and its parent body is not well understood.

In order to decipher the history recorded in Itokawa particles, we propose the investigation of U-Pb systematics of phosphates in Itokawa particles using NanoSIMS [4-5]. It is well established that this method has a great advantage of constraining on not only the thermal metamorphism age, but also the impact age by assessment of both ^{238}U and ^{235}U decay series, if U-Pb systematics is disturbed by secondary event [6]. This new insight would shed light on the impact history of near earth asteroids.

Samples and Analytical method: For this U-Pb age study, two polished thin sections of RA-QD02-0056 and RA-QD02-0031 that were reported to include phosphates grains, were allocated to us (hereafter, we call #0056 and #0031). Grain #0031 shows solid texture and mainly consists of olivine, plagioclase, chromite and troilite with accessary minerals, taenite and whitlockite. On the other hand, grain #0056 shows a brecciated texture and consists of olivine, plagioclase with several apatite grains. Sizes of most phosphate grains are from 2 µm x 4 µm to 4 µm x 5 µm in dimension.

For *in-situ* U–Pb dating we used a NanoSIMS installed at the University of Tokyo, Japan. A 0.1 nA O^- primary beam with acceleration voltage of 16 kV was focused to 1 µm and mapped an area from 2 µm x 2 µm to 5 µm x 5 µm by 32 pixel x 32 pixel, depending on the phosphate grain size. Since these mapping areas are comparable and/or slightly larger than the actual grain size, we extracted the appropriate pixels from the mapped area, of which ^{44}Ca ion counts are larger than 90% of those of standard apatite, and accumulated secondary ion counts of these appropriate pixels. Preliminary results were successfully obtained but we are planning to an additional measurement of a few more grains for better understanding of history of Itokawa, which are expected to include phosphates by X-ray CT.

References: [1] Nakamura T. et al. 2011. *Science*. **333**:1113-1116. [2] Noguchi T. et al. 2011. *Science* 333:1121-1125. [3] Tsuchiyama A. et al. *Science* 333:1125-1128 [4] Sano Y. et al. 2006. *Geochemical Journal* **40**:597-608. [5] Koike M. et al.2014 *Geochemical Journal* in press [6] Terada K. and Sano Y. 2012. *Mass Spectrometry* **1**:A0011.