H, C and N isotopic compositions of HAYABUSA Category 3 organic samples.

M. Ito[1], M. Uesugi[2], H. Naraoka[3], H. Yabuta[4], F. Kitajima[3], H. Mita[5], Y. Takano[1] Y. Karouji[2], T. Yada[2], Y. Ishibashi[2], T. Okada[2] and M. Abe[2]. [1]JAMSTEC. motoo@jamstec.go.jp. [2]JAXA/ISAS. [3]Kyushu University. [4]Osaka University. [5]Fukuoka Inst. Tech.

Introduction: Hayabusa space craft had brought back asteroid Itokawa particles to the Earth on June 2010. More than 1500 particles (composed of olivines, feldspars, Ca-pyroxenes, troilite, chromites, phosphates Fe-Ni metal grains, and other materials) were identified on the Qz glass after the compulsive free fall, and most of them were very small ranging from 10 to 300 μm but are mostly smaller than 50 μm [1-3]. In addtion several amount of carbonaceous materials (Category 3 samples) were found. Based on a FE-SEM with EDS observation at the JAXA curation facility, those materials mainly composed of C, N, O and some of them contain NaCl and KCl [3].

Initial investigations of the returned rocky materials have confirmed that those are asteroidal samples by mineralogical and isotopical studies [1, 4]. Since Category 3 samples were not investigated precisely yet, we need to be clarified either terrestrial or extraterrestrial material at first. Isotopic studies of H, C and N for extraterrestrial organic materials in Stardust cometary samples [5], IDPs [6], IOMs [7] and organic grobules [8] in primitive chondrites played a key role to provide an evidence of origin in the presolar molecular cloud or in the protoplanetary disk. If we find the isotopic anomaries of H, C and N in Category 3 samples, these may be an extraterrestrial origin.

Here we report H, C and N isotopic measurement of organic materials from Hayabusa Category 3 samples, RB-QD04-0047-02, RA-QD02-0120 and RB-QD04-0001. These samples were pressed on Au plate together with terrestrial standards of 1-hydroxybenzotriazole hydrate and BBOT ($C_{26}H_{26}N_2O_2S$) with known H, C and N isotopic compositions. Following the SEM study to check the sample condition, the samples were analyzed for H, C and N isotopic compositions by an isotopic imaging with the JAMSTEC NanoSIMS 50L ion microprobe at Kochi Institute for Core Sample Research.

Results: We evaluated isotopic analysis conditions by a NanoSIMS ion imaging through the measurements of terrestrail standards, an organic material that corrected from the rocket launch park at JAXA Tanegashima space center, IOM that extraceted from A881458 meteorite [9].

Isotopic images of RB-QD04-0047-02, RA-QD02-0120 and RB-QD04-0001 have homogeneous H, C and N isotopic composition. All samples had terrestrial H, C and N isotopic compositions within error ($\delta D = 60 \pm 13$ ‰, $\delta^{13}C = 3 \pm 3$ ‰ and $\delta^{15}N = -4 \pm 2$ ‰ for RB-QD04-0047-02; $\delta D = 81 \pm 54$ ‰, $\delta^{13}C = -20 \pm 8$ ‰ and $\delta^{15}N = 2 \pm 2$ ‰ for RA-QD02-0120; $\delta D = 135 \pm 32$ ‰, $\delta^{13}C = -20 \pm 9$ ‰ and $\delta^{15}N = 16 \pm 12$ ‰ for RB-QD04-0001, 1σ). We continue to measure few more Category 3 samples and will present isotopic data at the conference.

References: [1] Nakamura et al. 2011 *Science* 333:1113 [2] Tsuchiyama et al. 2011. *Science* 333:1125. [3] Hayabusa sample catalogue: http://hayabusaao.isas.jaxa.jp/catalog/cat3. [4] Yurimoto et al. 2011. Science 333:1116. [5] McKeegan et al. 2006. *Science* 314:1724. [6] Messenger 2000. *Nature* 404:968 [7] Busemann et al. 2006. *Science* 312:727. [8] Nakamura-Messenger et al. 2006. *Science* 314:1439. [9] Oba and Naraoka. 2009. *MaPS* 44:943.