RAMAN SPECTROSCOPICAL INVESTIGATIONS ON RETRURNED PARTICLES FROM THE ASTEROID ITOKAWA (JAXA HAYABUSA MISSION).

V.H. Hoffmann[1,2]; M. Kaliwoda[3]; R. Hochleitner[3]; T. Mikouchi[4]; M. Komatsu[5]; K. Hagiya[6]; K. Ohsumi[7]; M. Zolensky[8]; J. Martinez[9]; Y. Terada[7]; N. Yagi[7]; M. Takata[7]; W. Satake[4]; Y. Aoyagi[4]; A. Takenouchi[4]; Y. Karouji[10]; M. Uesugi[10]; T. Yada[10]. [1]Fac. Geosciences, Dep. Geo- and Environm. Sciences, Univ. Muenchen; [2]Dep. Geosciences, Univ. Tuebingen. Email lavho@web.de; [3]Mineralogical State Collection, Muenchen, Germany; [4]Dep. Earth and Planetary Science, The University of Tokyo, Japan; [5]Waseda Inst. Advanced Study, Waseda Univ., Japan; [6]School of Science, Univ. Hyogo, Japan; [7]Japan Synchrotron Radiation Research Institute (JASRI), Japan; [8]Astromaterials Research and Exploration Science, NASA-JSC, USA; [9]ESCG Jacobs, USA; [10]Inst. Space and Astronautical Science, Japan Aerospace Exploration Agency (JAXA), Japan.

Introduction: Numerous particles of the asteroid Itokawa have been successfully returned by the Hayabusa mission of JAXA in 2010. The recovered particles have been first studied by the preliminary examination (PE) team and the obtained results are providing unique information about the formation and evolution of asteroids or other small bodies in our solar system [1, and publications in this issue]. The mineral compositions and oxygen isotopes of the Itokawa particles are close to those of LL chondrites [1]. The samples have been distributed by JAXA as international AO study after the PE, and our team received 3 PE and 4 new particles. We have performed detailed studies on mineralogy and crystallography of these particles [2]. In this contribution we will report detailed results of our experiments by Raman Spectroscopy on three selected Itokawa particles.

Results: We could identify the following phases by LASER Micro Raman Spectroscopy: (1) Particle RA-QD02-0036: olivine, plagioclase, troilite, chromite and a whitlockite-merrillite phase. The sharp and well developed Raman pattern of the plagioclase phase indicate a weak shock stage of S1-2. (2) Particle RA-QD02-0041: olivine, plagioclase and minor chromite. This particle is generally characterized by a very high fluorescence background. Again, the features of the plagioclase Raman pattern indicate a quite low shock stage. (3) Particle RA-QD02-0133-01: this particle is dominated by olivine and plagioclase, we could not detect any other phases. The shock stage was estimated by the Raman pattern as quite similar to the other two particles.

Summarizing our Raman Spectroscopy results, one can state that all obtained spectra are of high quality. The sample material from asteroid Itokawa does not show any significant weathering or alteration effects. For the first time we have absolutely fresh and non-altered material from the surface of an asteroid in our hands, best suited for scientific investigations towards a much better understanding of the origin and development of meteorite parent bodies.

References: [1] Nakamura T. et al. (2011) *Science*, *333*, 1113–1116, and further Hayabusa-related publications in this Science Issue. [2] Mikouchi T., and the Hayabusa Sample Project Consortium (2014). Mineralogy and crystallography of some Itokawa particles returned by the Hayabusa asteroidal sample return mission. Earth, Planets and Space, 66/82.