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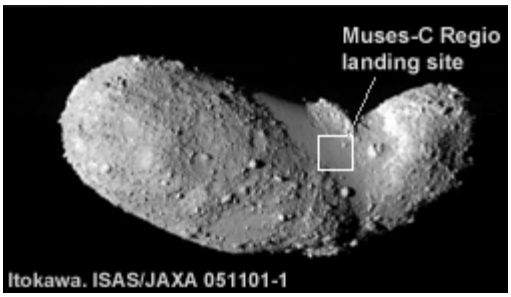
Quick Views of Big Advances

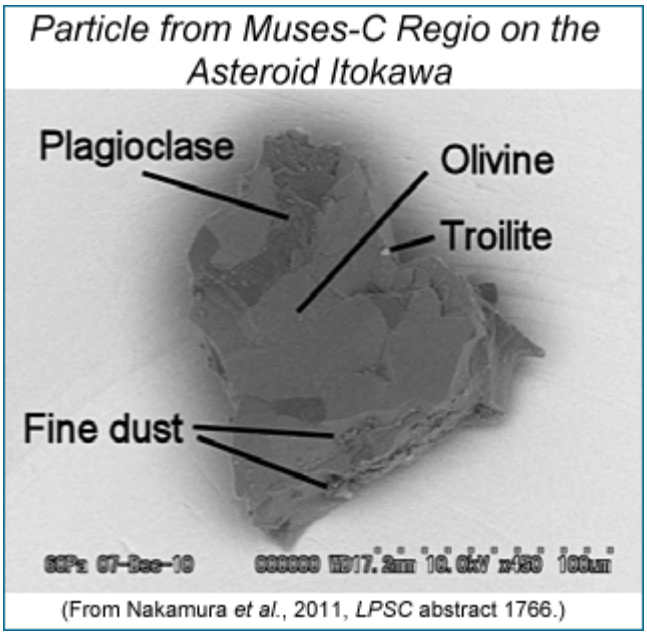
Asteroid Itokawa Samples



In 2010, the first samples of an asteroid were returned to Earth by the Japan Aerospace Exploration Agency (JAXA) Hayabusa Mission. On March 10, 2011 during the 42nd Lunar and Planetary Science Conference (LPSC) in The Woodlands, Texas, a special session is dedicated to results from Hayabusa. Thirteen oral presentations will describe what's been learned about the materials collected from asteroid 25143 Itokawa, including mineralogy and major element abundances of the particles. The laboratory analyses of these particles are providing the critical data to validate the long-held association between S-type ***asteroids*** and ***ordinary chondrites***.

Early work with ground-based visible and near-infrared spectroscopic observations showed a red-sloped S-type spectrum for Itokawa and a surface composition corresponding to that of ordinary chondrite meteorites reddened by space weathering. In particular, spectral characteristics and modeled olivine/pyroxene content of the asteroid closely matched the ***LL chondrite*** class [see, for example, work by Richard Binzel (Massachusetts Institute of Technology) and colleagues in 2001].


Retrieval team with the Hayabusa sample capsule shortly after landing in Australia. Courtesy of JAXA.



(From Nakamura *et al.*, 2011, *LPSC* abstract 1766.)

Hayabusa, launched in May 2003 to asteroid 25143 Itokawa, was designed to combine new remote sensing data and returned samples to assess, definitively, the relationship between S-type asteroids and LL chondrites. The mission's intended lander never made it to the surface and technical difficulties prevented the planned sampling sequence, yet the Hayabusa spacecraft itself touched down on the asteroid's region known as Muses-C regio and returned its sample capsule to Earth in June 2010.

The painstaking processes of dismantling the capsule and removing the contents took months while the scientists and public waited for news of how much asteroid dust was inside. At long last, JAXA's press release in November 2010 announced the wonderful news that about 1,500 particles from asteroid Itokawa were extracted successfully from the Hayabusa sample capsule. Mostly less than 10 micrometers in size, about a third of these particles are olivines. Another third are pyroxenes, feldspars, and sulfide. And a third

of the particles are mixtures of several mineral phases. The Hayabusa science team report in a LPSC abstract [*#1766*] that the mineralogy and mineral chemistry of the Itokawa particles are consistent with LL chondrite compositions, confirming the remote sensing measurements. They also found that the particles are depleted in iron-nickel metal compared with typical LL chondrites. More details will be presented in March at LPSC. Following the preliminary examinations by the Hayabusa team, the samples of near-Earth asteroid Itokawa will be made available to scientists worldwide for further analyses.

See: ***Results from Hayabusa*** the 2011 Lunar and Planetary Science Conference Special Session (March 10, 2011) and the ***JAXA-Hayabusa Mission website***. Additional background, see Binzel, R. P., Rivkin, A. S., Bus, S. J., Sunshine, J. M., and Burbine, T. H. (2001) MUSES-C Target Asteroid (25143) 1998 SF36: A Reddened Ordinary Chondrite, *Meteoritics and Planetary Science,* v. 36, p. 1167-1172 [***NASA ADS entry***].

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