



Supporting Online Material for

Infrared Spectroscopy of Comet 81P/Wild 2 Samples Returned by Stardust

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This PDF file includes:

SOM Text

Supporting Online Material

FTIR Measurements

The FTIR measurements were made on individual grains extracted from the aerogel and placed on CVD (chemical vapor deposition) diamond or KBr windows, grains pressed in Au substrates, aerogel keystone with whole tracks, and ultramicrotome thin sections of individual grains. FTIR measurements were obtained on nearly 50 extracted grains from 9 different tracks supported on CVD diamond windows using conventional lab-based instruments. Many of the FTIR measurements were obtained using synchrotron-based instruments on beamlines. The synchrotron light source provides over 100x the brightness of conventional global sources. Transmission FTIR spectra were collected using FTIR microscopes over the wavelength range of 4000 to 650 cm^{-1} with apertures selected to maximize the signal while minimizing scattering effects. We also collected spectra directly from microtome thin sections of the grains on thin amorphous C substrates. The samples and the microscope were continuously purged with dry N_2 . Background spectra were acquired from the substrate film immediately adjacent to the sample. Final baseline corrected and smoothed spectra were obtained by subtracting the background from the sample spectrum. Between 1000 and 4000 scans (interferograms) were averaged for each specimen with a spectral resolution of 4 cm^{-1} . Detection limits for different species vary with mass, band strengths, spectral overlap and other factors, but are typically in the percent range.

Organic Modification Tests

Tests performed using hypervelocity impact (~6 km/s) of organic standards into Stardust-like aerogel suggest that alteration during capture is highly dependent on the nature of the organic material in the projectile. For example, studies of test shots of pyrene, show the impact distributes material all along the track, and even a few track widths into the surrounding aerogel, but show little evidence of oxidation or other alteration of the original aromatic molecules. In contrast, cocoa powder mixed with small soda-lime glass spheres and fired into aerogel shows a different behavior. In this case, essentially none of the original organics were found in association with the terminal soda-lime glass spheres; all the organic matter was found distributed along the bulb-shaped track and at least several track widths into the surrounding matrix. However, in this case there was evidence of extensive alteration of some of the molecular components of the original cocoa powder, both in the form of bond-breaking and bond-creation.

X-ray Mapping

Elemental X-ray maps of the amorphous silicates were obtained using a JEOL 2500SE Nanoanalysis scanning transmission electron microscope (STEM) equipped with a field-emission gun and a Noran 50mm2 thin window energy-dispersive X-ray detector. The maps were obtained by restoring a 4 nm probe with a beam current of 8 nA with a 204x256 pixel array. An automatic correction for specimen drift was applied every 60

sec. The pixel dwell time was 1 msec/pixel/frame and the map represents a composite of 30 frames (total dwell time/pixel was 30 msec).