

# **Spitzer Space Telescope Observations of the Deep Impact Encounter with Comet 9P/Tempel 1**

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We have utilized the IRS imaging spectrometer on board the Spitzer Space Telescope to obtain observations of the Deep Impact encounter with comet 9P/Tempel 1. Observations were obtained before, during, and after the delivery of 19 GJoules of kinetic energy to the surface of the comet by a 364 kg payload at 10.2 km/sec. While lightcurves, images, and spectral maps were obtained, we focus here on the highly structured 5 - 35  $\mu\text{m}$  spectra of the ejecta obtained during the first few hours after impact. These represent the best measurement to date of the composition of the sub-surface solid material of a comet. Emission signatures due to silicates, carbonates, phyllosilicates, water ice, amorphous carbon, and Mg/Fe sulfides were found. The atomic abundance of the observed material was consistent with solar system abundances. From measurements made by the Deep Impact spacecraft and SST, it can be shown that the  $10^5$  to  $10^7$  kg of material ejected was unaltered, with the exception of the de-aggregation of loosely held macro-particles into their individual 0.1 - 1.0  $\mu\text{m}$  building blocks. The presence of a large amount of crystalline silicates, phyllosilicates, and carbonates in the comet's interior has fundamental implications for the nature of the material incorporated into the comet 4.5 Byrs ago.