# INTACT CAPTURE OF COSMIC DUST

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Cosmic dust are extraterrestrial particles of cometary, asteroidal, samples of planetesimals or even interstellar origin. Capturing these particles and returning them to Earth so that they can be individually analyzed will contribute to our understanding of the origin and evolution of our solar system. Dust analyses include elemental, isotopic, and organic compositions and morphologic, petrographic, and phase studies. The precision of the measurements and the range in sizes of analyzed particles will exceed what can be done with in situ techniques on any space flight missions. Furthermore, when particles can be captured intact without melting, then biological elements and compounds and especially the original structural and phase characteristics of the material can be preserved. This information is important to the study of the cosmic evolution of biogenic compounds and the development models for prebiotic and biotic evolution.

The encounter speeds of cosmic dust in Earth orbit are at hypervelocities. It was believed that hypervelocity particles could not be captured intact; thus, the use of capture cell or atomized capture of cosmic dust. The focus of this development effort is to capture dust particles at hypervelocities intact, unmelted to preserve even volatile organics, at the same time the capture process must minimize any organic elemental or compound contamination to prevent any compromise of exobiological analyses. Inorganic silicate aerogel has been developed as a successful capture medium to satisfy both requirements of intact capture and minimal organic contamination. Up to 6 km/s, silicate projectiles from few microns up to 100 μm have been captured intact without any melting and with minimal loss of mass. Carbon in silicate aerogel can be reduced to less than 1 part in 1000 and hydrogen 3 parts in 1000 when baked in air. Under controlled inert gas environments additional hydrocarbon reduction can be achieved.