**MINERALOGY OF TERMINAL PARTICLES AND OTHER LARGE MINERAL FRAGMENTS OBTAINED FROM STARDUST TRACKS.**

D. J. Joswiak , D. E. Brownlee and G. Matrajt, Dept. of Astronomy, University of Washington, Seattle, WA. joswiak@astro.washington.edu

**Introduction:** We examined the mineralogy, textures and phase relationships of terminal particles (TP) and other large mineral fragments from 16 Stardust (SD) tracks. Within individual tracks all fragments are believed to have been attached to the main track TP prior to impact. Here we provide a summary of the important minerals observed focusing on only those that are likely to have originated in comet Wild 2 and were not severely modified during capture. It is hoped that these mineralogical data can provide a useful database for future researchers who can use the prepared samples for complementary studies.

**Methods**: Each track was keystoned [1], followed by flattening and embedding in acrylic resin [2]. Microtomed sections of each large mineral fragment were then examined with a Tecnai F20 STEM using standard TEM methods including BF and DF imaging, electron diffraction (ED), HRTEM, EDX and occasionally EELS. Some of the potted butts were also examined with backscattered electrons using a JEOL 7000 FESEM.

**Results**: The individual particles observed in the 16 tracks showed highly variable mineralogy ranging from monomineralic grains to complete Wild 2 'rocks' which were composed of various silicates, oxides, sulfides, FeNi metal, glass and a number of unusual phases including the amphibole richterite, roedderite and probable majorite. One track (Track 25) contains CAI minerals, including highly refractory sub-10 nm osbornite inclusions, while a number of other tracks contain mineralogy analogous to some chondrules. Some of these samples were also discussed during the preliminary examination period [3].

Four tracks are dominated by large monomineralic grains including clinoenstatite (Track 20), pentlandite (Track 59), a 2 um kamacite grain (Track 38) and two discrete widely-separated particles in Track 10, one composed of $Fo_{99}$ and the other composed of pyrrhotite.

Most of the SD particles are composed of multiple phases with pyroxene the most common mineral followed by olivine. Enstatite was observed in Tracks 17, 20, 27, 41, 56, 57 and 80 while high-Ca pyroxenes were observed in Tracks 17, 25, 27, 58 and 77. Ferrosilite may be present in Track 26. Olivines - ranging from $Fo_2$-$Fo_{99}$ – varied from minor to modally dominant and were found in 8 tracks (10, 17, 22, 26, 57, 58, 71 and 77).

Large pyrrhotite fragments were present in Tracks 10, 57 and 77 and appear to have been associated with olivines or pyroxenes while resident in Wild 2. A > 1um FeNi grain with a schreibersite inclusion and associated with $Fo_{60}$ was present in Track 77. Six tracks contain Na+Cr-bearing silicates some of which have ED patterns consistent with high Ca-pyroxenes.

**Conclusions**: The large variety of minerals observed in SD fragments clearly show that comet Wild 2 is composed of a rich and diverse assemblage of 'rocks' many of which have mineralogical similarities to known meteoritic materials including CAI's and chondrules.

**References:** [1] A. J. Westphal et al., 2004, *MAPS*, 39: 1375-1386. [2] G. Matrajt and D. E Brownlee, 2006, *MAPS* 41:1715-1720. [3] M. E. Zolensky and others, 2006, *Science*, vol 314, 1735-1739.