RESULTS FROM THE SEARCH FOR TYPICAL CP IDP SILICATES IN COMET 81P/WILD 2 DUST SAMPLES.

H. A. Ishii[1], J. P. Bradley[1], Z. R. Dai[1], M. Chi[1,2], A. T. Kearsley[3], M. J. Burchell[4], N. D. Browning[1,2] and F. J. Molster[5]. [1]Institute of Geophysics and Planetary Physics, Lawrence Livermore National Lab, Livermore, CA, USA. E-mail: hope.ishii@llnl.gov. [2]Dept of Chem. Engineering & Materials Sci., University of California, Davis, CA, USA. [3]Dept of Mineralogy, Natural History Museum, London, UK. [4]School of Physical Sciences, University of Kent, Canterbury, Kent, UK. [5]NWO, Den Haag, The Netherlands.

Introduction: The chondritic porous subset of the interplanetary dust particles (CP IDPs), collected during high altitude stratospheric flights, were widely expected to be the closest cousins of comet dust returned by the NASA Stardust mission to Comet 81P /Wild 2 [1]. Decades of research have shown CP IDPs display characteristics consistent with cometary origins and with comet observations: mineralogy, friability, IR spectra, heating profiles, high carbon abundance, highest abundances of presolar grains. Comet Wild 2 is believed to originate beyond Neptune's orbit among Kuiper belt comets [2] and so was hoped to hold large quantities of presolar stardust grains. Results to date include presolar grain abundances similar to meteorites [3] and characteristic inner solar system materials, a CAI and igneous fragments typical of chondrules [4]. We searched Wild 2 samples specifically for two silicate materials typical of CP IDPs [5], enstatite platelets/whiskers and glass with embedded metal and sulfides (GEMS). Enstatite platelets/whiskers are readily recognizable and are uniquely [100]-elongated in CP IDPs. GEMS are abundant in CP IDPs, some shown to have presolar origins consistent with having been interstellar amorphous silicates.

Results: As reported in our recent publication [5], we identified a single enstatite whisker, but with an elongation direction characteristic of terrestrial and meteoritic enstatite instead of CP IDPs. A large abundance of objects that look, in TEM imaging, like GEMS are found in the Wild 2 sample [2]. By laboratory light gas gun shots, we demonstrated that capture of sulfides by silica aerogel at Stardust impact speed produces glass with embedded metal and sulfides and reproduces sulfide-rimmed metal beads seen in Wild 2 samples. Given the presence of melted-and-quenched pyroxenes that may have donated non-Si cations to a silicate glass, differentiating possible native GEMS from fine-grained material generated by impact is unlikely to be successful.

Conclusions: We have demonstrated that impact capture in aerogel, even at the relatively slow speeds of the Stardust mission, creates significant fine-grained intermixed material. The lack of recognizable GEMS and enstatite whiskers characteristic of the CP IDPs – in combination with prior results of inner solar system refractory objects, isotope ratios consistent with inner solar system chondrites and little refractory carbon – indicate that comet Wild 2 dust is petrogenetically more closely related to the chondritic meteorites than the CP IDPs.

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