FINE GRAINED MATERIAL IN WILD 2 IN INTERACTION WITH THE STARDUST AEROGEL. H. Leroux and J. Stodolna. Laboratoire de Structure et Propriété de l'Etat Solide UMR CNRS 8008 Université de Lille 1. E-mail: Hugues.Leroux@univ-lille1.fr.

Introduction: The hypervelocity impacts of comet particles at 6.1 km/s have left tracks in the Stardust aerogel. The terminal particles are usually coarse grained minerals but abundant material is also present along the track walls as illustrated by synchrotron X-rays fluorescence spectroscopy [1]. This configuration suggests that the Wild 2 particles are made of poorly cohesive assemblages that have been broken and scattered during the impact into the aerogel. Material left along the track walls appears to have been subjected to strong thermal alteration and mixing with the aerogel [2], making its study difficult. Here we present results obtained by transmission electron microscopy (TEM) and associated EDS microanalysis of particles extracted from walls of tracks. The objective of this work is to study the fine grained component of Wild 2 despite the fact that this material experienced thermal modifications during the capture.

Results: The typical microstructure of the samples consists of a silica-rich glassy matrix containing a high density of Fe-Ni-S nanophases and vesicles. This microstructure strongly resembles to the one of GEMS (glass with embedded metal and sulfides) which is the most common amorphous silicates in chondritic porous interplanetary dust particles (CP-IDPs). However the Stardust GEMS-like objects have a high silica concentration, revealing that the cometary material has been melted and mixed with melted aerogel. The composition of the silica-rich glassy matrix is frequently highly variable on a sub-μm scale. Elemental X-ray intensity maps reveal amorphous patches enriched in elements such as Mg, Al or Ca (for instance), enclosed within melted aerogel. Point analysis shows that the glassy matrix is FeO-poor. The average bulk compositions are close to the CI composition, including S and excepting Si due to the aerogel contribution.

Discussion and conclusion: The studied Stardust material shows clear evidence for melting and mixing with melted aerogel due to the high temperature stage of the capture. The very low concentration of FeO in the glassy matrix shows highly reduced conditions, suggesting that a significant part of the Fe-droplets formed in situ by reduction of ferromagnesian silicates [3]. The distribution of the elements within the glassy matrix suggests that the cometary material was constituted of an assemblage of Mg-rich silicates (several hundreds of nm in size) and an ultrafine grained component. The average bulk composition is CI-like, thus enriched in S compare to the bulk composition of chondritic meteorites (see also [4]). We conclude that the studied material does not resemble asteroidal material but could be related to CP-IDPs or other materials which did not experienced processing in the inner protoplanetary disk.

References: [1] Flynn G. J. et al. 2006. *Science* 314:1731–1735 [2] Leroux H. et al. 2008. *Meteoritics & Planetary Science* 43:97-120. [3] Leroux H. et al. 2009. *Geochimica et Cosmochimica Acta* 73:767-777. [4] Westphal A. J et al. 2009. *Astrophyscial Journal* 694 :18-28.