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Capturing Stardust - Advanced Studies of Interstellar Dust Analogue Tracks in Stardust Flight Spare Aeogel

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In 2000 and 2002 the Stardust Mission exposed aerogel collector panels for a total of about 200 days to the stream of interstellar grains sweeping through the solar system. The material was brought back to Earth in 2006. We present laboratory calibration of the collection process by shooting high speed [5 - 30km/s] interstellar dust (ISD) analogues onto Stardust aerogel flight spares. In a subsequent survey in an optical microscope the impacts were identified, then track diameters and depths were measured at high magnification. Subsequently tracks in picokeystones were extracted and analyzed with Scanning Transmission X-ray Microscopy (STXM). This enabled an investigation into both the morphology of impact tracks as well as any structural and chemical modification of projectile and collector material.
A major campaign started in spring 2010 with the goal to characterize tracks of interstellar grains with respect to the projectile speed, size, and density. Three different materials (orthopyroxene, iron, polystyrene) were therefore shot within several narrow speed and size windows (e.g. 14 - 16 km/s, 0.37 – 0.43μm). For each set of parameters, about 50 particles were collected. First results show a bulbous track shape at 15 km/s, similar to type A Stardust tracks, with a terminal particle. For the first time it could be shown experimentally that cores of sub-micron minerals survive aerogel capture at speeds well above 10km/s.
The laboratory calibration allows for a recalculation of the ISD flux for the Stardust collection period. Preliminary results indicate a quite different ISD flux than previously assumed.