PROCESSING OF ORGANIC MICROPARTICLES DURING CAPTURE IN AEROGEL. N. J. Foster\(^1\), M. J. Burchell\(^1\), J. Ormond-Prout\(^2\), D. Dupin\(^2\) and S. P. Armes\(^2\).

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**Introduction:** Hypervelocity capture in space has long been established in aerogel targets [1]. Since the first laboratory demonstration of capture [2] aerogel collectors have been flown in space for extended periods on several missions. Particles during hypervelocity capture can be significantly ablated, altering the size and structure of the projectile, potentially biasing any subsequent analysis. The presence of rims forming on particles during capture has been reported [3]. Reductions in diameter by up to 20% & up to 50% in mass have been shown in some capture events [4]. Here we investigate the use of organic microparticles coated with a layer of an organic conducting polymer. The overlayer comprises of only 0.8% by mass of the projectile, it has a very strong Raman signature, hence its survival or destruction is a sensitive measure of the extent of chemical degradation suffered by these organic microparticles.

**Experimental Method:** Polystyrene (PS) microparticles (thermal degradation temperature 500°C) with a mean diameter of 20 μm were coated with 20 nm of polypyrrole (PPy) [5,6]. Five different speeds were used for the experiment 1.07, 1.95, 3.33, 4.55 and 6.11 km s\(^{-1}\). Silica aerogel targets were used of density 25 − 35 kg m\(^{-3}\). Extensive characterisation of the projectiles was carried out using Raman spectrometry, along with optical microscopy and electron microscopy. This was carried out on pristine samples before firing and on each of the captured samples.

**Results & Discussion:** Optical analysis of the captured microparticles at 1.07 km s\(^{-1}\), showed comparable dimensions to the pristine microparticles, confirming no significant mass loss occurred. However, at 3.3 km s\(^{-1}\) there was a reduction in diameter of ≈ 3 μm, removing PPy coating. At 6.11 km s\(^{-1}\) (similar to that of the Stardust encounter [7]), the captured particles had only 54 % of the original diameter, a loss of 84 % mass. Raman data showed at 1.17 km s\(^{-1}\) the captured microparticle is very similar to that of the pristine PPy-PS latex. All spectral features characteristic of both PPy and PS disappear after capture at 1.95 km s\(^{-1}\). Instead, only two broad bands are seen at 1374 and 1590 cm\(^{-1}\); (the carbon D and G bands). At 3.3 km s\(^{-1}\), these bands become stronger. Similar observations were made at 6.17 km s\(^{-1}\). Although PS and PPy are not necessarily appropriate analogues for all organic molecules, results suggest that substantial thermal processing and chemical degradation of organic-rich cometary grains can be expected at a capture speed of 6.1 km s\(^{-1}\).


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