THE SEARCH FOR INTERSTELLAR PARTICLE (ISP) IMPACTS ON STARDUST ALUMINIUM FOILS

A. T. Kearsley (antk@nhm.ac.uk), C. Allen, S. P. Armes, S. Bajt, A.D. Ball, R. Bastien, H. Bechtel, J. Borg, F. Brenker, J. C. Bridges, D. E. Brownlee, M. J. Burchell, M. Burghammer, A. Butterworth, R. Chater, P. Cloetens, G. Cody, A.M. Davis, T. Ferroir, C. Floss, G. Flynn, D. Frank, Z. Gainsforth, E. Grün, P. R. Heck, J. Hillier, P. Hoppe, F. Hörz, L.E. Howard, B. Hudson, G. R. Huss, J. Huth, B. Lai, M. Landgraf, L. Lemelle, J. Leitner, H. Leroux, L. Nittler, R. Ogliore, M. C. Price, F. Postberg, S. A. Sandford, S. Schmitz, G. Silversmit, A. Simionovici, R. Srama, F. J. Stadermann, T. Stephan, R. M. Stroud, S. Sutton, R. Toucoulou, M. Trieloff, J. Trigo-Rodriguez, P. Tsou, A. Tsuchiyama, T. Tyliczszak, B. Vekemans, L. Vincze, J. Warren, A. J. Westphal & M. E. Zolensky (Stardust Interstellar Preliminary Examination (ISPE) team).

Interstellar Particles (ISP): A dedicated collector on Stardust was deployed to collect ISP for 195 days [1]. The suggested number, size, trajectory and velocity on capture were predicted by [2]. Although aerogel tracks [3] consistent with ISP origin have been found and some have already been analysed [4,5], searches of Al foils for ISP craters were delayed for technical reasons of safe extraction, handling and contamination control [6]. Foil strips are now mounted on robust holders suitable for a variety of analytical instruments. Imaging protocols and contamination limits permitting subsequent successful Auger analysis [7] have been evaluated. Six laboratories have validated clean instruments so far, and searches for ISP impact craters have begun. The large data sets give problems for storage, retrieval and analysis, so protocols for automated image acquisition and crater recognition [8], and distributed image examination are being tested. Although the very small number of craters expected (< 20 total), their small size (≤ μm), variable surface contamination by aerogel debris, and the foil roughness might make the search look difficult and potentially unrewarding, probable candidate craters have already been found [9,10,11], hinting at far greater numbers than expected from ISP flux alone. Methods for recognizing oblique impacts by spacecraft-derived debris (as have been tentatively recognized in the collector aerogel blocks [5]) are being tested, and laboratory impacts with calibration particles of known composition and size at appropriate velocity for ISP are in progress with a Van de Graaf accelerator [12]. The possibility of confusion between ISP impact craters and those from nm-scale particles accelerated by the solar wind to > 300 kms^{-1} [13] is also being investigated, using both numerical models and direct comparison to Genesis materials. In ISPE, our simple aim is to find as many foil craters as possible, without damaging them in any way, prior to their further analysis.

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