ANALYTICAL METHODS FOR DISCRIMINATING STARDUST IN AEROGEL CAPTURE MEDIA

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Comet 81P/Wild 2's serendipitous orbit change to the inner solar system in 1974 offered researchers a rare opportunity to sample cometary material only recently removed from the Kuiper belt, the source of short-period comets and considered to be the "cold storage locker" of material left over from solar system formation ~4.6 Gyr ago. NASA's Stardust mission intercepted the comet in January 2004 and returned with material collected from the tail of the comet to Earth in January, 2006. The cometary material, consisting of grains ranging from 10 microns down to <2 nm, was collected in aerogel, a very low density (~3 mg/cm^3) silica foam, to minimize the effects of deceleration from 6.1 km/s. The entire deceleration track is extracted from the aerogel block as a pyramidal shape known as a keystone which can be mapped using x-ray fluorescence prior to extraction of terminal or intermediate particles for other analyses. One goal of the track mapping is to determine the bulk composition of the cometary material returned. Unfortunately, although the aerogel is predominantly SiO_2 there are sufficient quantities of trace elements similar to those expected in the cometary material to require sophisticated discrimination techniques in order to decide whether a fluorescence map pixel contains only aerogel or both aerogel and cometary material. We have developed a dual threshold analysis approach for better distinguishing cometary material from aerogel contaminants and have applied it to five Stardust impact tracks and terminal particles. Complete results from the refined composition analysis and discussions of inferred mineralogy have been submitted for publication. Here, we present aspects of the dual threshold approach and demonstrate its impact on track composition.