**Polyvinylidene Fluoride Impact Charge Production After High Temperature Exposures**

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**Abstract:** Polyvinylidene Fluoride (PVDF) dust impact detectors are simple and reliable instruments for measuring dust flux in space. These detectors have made their mark across the solar system on a variety of missions starting on Vega 1 and 2 while being used most notably on the New Horizons spacecraft as the Student Dust Counter.

Previously, these films have only been proven to work reliably in a temperature range of -50 C to +50 C. In order to test the utility of PVDF in higher temperature environments a series of experiments was conducted. A PVDF film was exposed to increasing temperatures for increasing time intervals. Initially, the film was exposed to 80 C for 48 hours, then 100 C for 48 hours. Then a series of exposures at 120 C for 48 hours, 96 hours, and 192 hours. These intervals were chosen such that the total exposure at 120 C was 336 hours, or 14 days, which is the length of one lunar day.

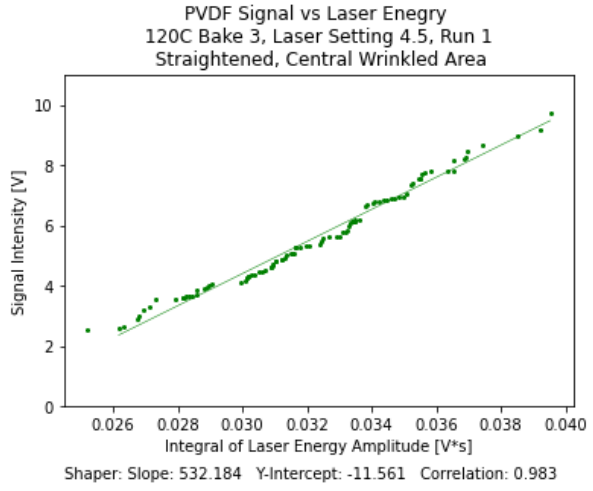


Figure 1: Laser pulse strikes on PVDF and linear fit after the film was exposed to 7 days cumulatively at 120C.

A short pulse (μs) high energy (~100W) laser was used to simulate dust impacts in between heat exposures. The relative strength of the laser pulse was compared against the signal return from the PVDF film as seen in figure 1. The linear fit slope of each experiment between exposures was compared and initially suggests a gradual decay in the PVDF charge production as it is exposed to high temperatures.

Iron dust impactors from the dust accelerator at the Institute for Modeling Plasmas, Atmospheres, and Cosmic Dust (IMPACT) at the Laboratory for Atmospheric and Space Physics (LASP) were used after the final heat exposure.

If the results of this experiment suggest that the decay of the charge production of PVDF at these high temperatures is gradual, then PVDF may be a suitable candidate for dust flux measurements on the surface of the moon.