Development of a high dynamic range ion detector for the in-situ analysis of cosmic dust
J.R. Rocha

In-situ dust measurements provide the capability of obtaining information about dust properties in virtually any place in the solar system. With knowledge about the origin of dust particles in space, we can better understand the distant, remote environments from which cosmic dust comes from. Dust instruments offer a unique and economical alternative to expensive sample-return missions, and they enable observations for a wide variety of targets from a single spacecraft. In recent years, the SUrface Dust Analyzer (SUDA) and Hyperdust in-situ dust analyzers have been proposed and developed at the Laboratory for Atmospheric and Space Physics (LASP) at the University of Colorado Boulder. One of the key components in a dust analyzer is the ion detector, which is responsible for determining the chemical composition of impacting dust grains. SUDA and Hyperdust both require electron multipliers for dust measurements similar to the MM1 ion detector used on the Cosmic Dust Analyzer (CDA), but, due its lack of commercial availability, it was not possible to obtain. As a result, a facility was developed at LASP to manufacture robust and high-dynamic-range ion detectors for space applications. Using the MM1 as a guide, the individual stages of the developed ion detector, called dynodes, were designed, manufactured and activated to optimally perform in a dust analyzer instrument. This facility will provide a long-term solution for the particle detectors of future dust analyzer instruments, and will have the capability of manufacturing custom-sized ion detectors for specialized space applications. In this study, we discuss the development of the ion detector mechanical assembly and dynode structure, the detector activation process which increases the secondary electron emission of the dynodes and report the latest results from the fully assembled ion detector.