

Nano dust analyzer for the detection and chemical composition measurement of particles originating in the inner heliosphere

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In-situ dust analyzers based on impact ionization make critical contribution to the understanding of the origin and dynamics of dust in the solar system. The newest instrument under development in our laboratory is the Nano-Dust Analyzer (NDA) that is designed to detect nanometer-sized particles of asteroidal and cometary origin that are generated near the Sun and accelerated to velocities close to that of the solar wind. The motivation for the NDA development is the observations by the two STEREO spacecrafts that indicated the possibly very high fluxes of nano-sized particles¹. These particles are generated by collisional grinding or evaporation of meteoric material near the Sun and subsequently accelerated outward by the solar wind. The temporal variability reveals the complex interaction with the solar wind magnetic field within 1 AU and provides the means to learn about solar wind conditions. The composition analysis will report on the processes that generated the nanometer-sized particles (chemical differentiation due to dust-dust collisions, or heating). NDA is a sensitive linear time-of-flight mass analyzer that is designed to operate while pointed close to the solar direction. The UV radiation and solar wind plasma effects are reduced by employing a light trap system and biased grids, respectively. A laboratory prototype has been built, tested, and calibrated at the dust accelerator facility at the University of Colorado, Boulder, using particles with 1 to over 50 km/s velocity.

¹ Meyer-Vernet, N. et al., *Solar Physics*, 256, 463, 2009