

MICROMETEOROID ABLATION SIMULATED IN THE LABORATORY USING A DUST ACCELERATOR

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A facility is developed to simulate the ablation of micrometeoroids in laboratory conditions, which also allows measuring the ionization probability of the ablated material. An electrostatic dust accelerator is used to generate iron and aluminum and meteoric analog particles with velocities 10-50 km/s. The particles are then introduced into a cell filled with nitrogen, air or carbon dioxide gas with pressures adjustable in the 0.02 – 0.5 Torr range, where the partial or complete ablation of the particle occurs over a short distance. An array of biased electrodes is used to collect the ionized products with spatial resolution along the ablating particles' path, allowing thus the study of the temporal resolution of the process. A simple ablation model is used to match the observations. For completely ablated particles the total collected charge directly yields the ionization efficiency. The measurements using iron and aluminum particles in N₂ and air are in relatively good agreement with earlier for velocities where complete ablation occurs. A newly developed system using a multichannel photomultiplier tube observation system is used to make the optical detection of the ablating particle that allows reconstructing the dynamic interaction with with the ambient gas.