2.1.3 Composition of Impact-Plasma measured by a HELIOS-Micrometeoroid-Detector

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The composition of the impact-plasma, produced by dust particles hitting an Au-target was measured, using a model of the HELIOS-micrometeoroid-detector. The 2 MV dust accelerators of the MPI für Kernphysik, Heidelberg, and the NASA Ames Research Center were used to accelerate particles consisting of Al, Al_2O_3, SiO_2, Soda-Lime-Glass, Polystyrene and Kaolin to velocities between 2 km/sec and 15 km/sec. Fe-projectiles could be accelerated up to 40 km/sec. The masses of the dust grains were between 10^{-15} g and 3×10^{-10} g. The experiments showed, that because of the characteristic features of the measured spectra it is possible to separate noise events from impacts even at a high noise background. The smallest particles ($m \approx 10^{-15}$ g) triggering the experiment produce spectra well above the noise level (more than a factor 10) because of the high sensitivity of the ion-detector (multiplier).

Two different types of mass spectra were observed, depending on material properties:

a, Metals and hard dielectrics Fe, Al, Al_2O_3, SiO_2, Soda-Lime-Glass. Particle constituents of low ionisation energy (7 eV, for example Na, K, Al) are dominating in the spectra of those materials at low velocities. Going to higher velocities the relative intensities change and new ions with higher ionisation energy coming from minor constituents of the projectile and target occur (e.g. C^+, H^+).

b, Low hardness dielectrics (Mohs' hardness 3)
The materials Polystyrene and Kaolin produced less total charge than the others did. Most of the plasma ions were molecules of the form $C_nH_m^+$ originating from adsorbed surface layers on the target or on the dust particles. The portion of elements with low ionisation potential (e.g. Li, Na, K, Al etc.) is comparatively small.

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