Components of Impact Plasma: Velocity and Temperature

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Impact ionization is a process of plasma generation upon hypervelocity impact of a small body (e.g., interplanetary dust grain) onto a solid surface. Such process may play an important role in astrochemistry. Understanding the plasma generation, we can clarify the interpretation of proclaimed dust impact detections onto antenna-equipped space experiments, which have become widely popular in the recent years.

We present the data gained in charge generation and collection experiments conducted at the University of Colorado IMPACT hypervelocity dust accelerator facility. The impacts are of sub-micrometer cosmic dust simulants onto a metal target in the range of velocities between 1 and 50 km/s. We discuss measured charge collection on a microsecond scale as well as aggregated results of electron and ion drift velocities and temperatures and specifically their dependence on the velocity of the impactor.