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Microgravity Experiments from Sub-Orbital to Orbital Platforms (3)

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# COLLISIONS OF CHARGED GRAINS IN MICROGRAVITY

**Abstract**

In drop tower experiments monodisperse, sub-mm sized glass spheres were triboelectrically charged and released into a capacitor. Trajectories then provide the net charge of the particles. After colliding with the capacitor plates charge transfer and coefficients of restitution were measured.
We find that the threshold velocity below which grains stick to an electrode depends on the net charge. Particles with high velocity (e.g. dm/s) and high charge (e.g. 10 million elementary charges) can stick where uncharged grains do not stick. That is caused by the attraction of a mirror charge, which boosts the impact velocity at small distance to the electrode. This leads to a larger dissipation of energy during the collision and the particles cannot escape from the mirror potential upon rebound. This requires non homogeneous charge distributions on the surface. The charge transfer during a rebounding collision is not predefined by the electrical field of the capacitor or net charge of the grain. This also requires non homogeneous charge distributions. The absolute amount of charge transferred depends on the kinetic energy of the impact. At low energy it is constant, at higher energy it increases linearly with collision energy. We attribute this to the size of the contact area. Slow charge transfer related to the field occurs on grains sticking to the electrodes. In total, the experiments show that non homogeneous charge distributions are important in determining the collisional outcome in slow particle collisions.