Dust Interaction with Energetic Particles — A Laboratory Simulation

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Dust grains in space frequently face energetic particles, e.g., ions, electrons, X-ray, positrons, etc. Such a broad variety of particle–dust interactions plays a significant role in dust charging and surface modification. The combination of high energy of particles together with a limited size of objects (dust) comprises interesting mesoscopic structure with non-obvious behavior. While in situ experiments are difficult and rare, we observed particular interactions experimentally in an electrodynamic trap. It allows us to study of a single dust grain temporal evolution under well defined conditions, i.e., to somewhat separate aforementioned processes and to investigate them individually. We present a summary of laboratory simulations and their comparison with simple theoretical models. We discuss dust charging by different elementary particles and its importance for various space regions.