Dust is an almost ubiquitous component of the cosmic plasma (e.g., planetary and cometary magnetospheres, the heliosphere, the interstellar medium, supernova shells). However, it can be also frequently encountered in industrial applications as a principal agent in material treatments, or as an undesirable ingredient in a production of microelectronic components, or in fusion devices. Since dust particles are one of the main elements of interest in the solar system (e.g., Earth, Jovian and Saturnian systems) and in the interstellar medium, there is a number of missions (e.g., ROSETTA, Cassini) that provided investigations of the properties and global dynamics of charged dust grains. In these environments, the relevant charging processes are interactions with electrons and ions of the solar wind and photoemission by solar UV radiation that often dominates. However, *in-site* investigations of such processes are difficult because several processes act in accord. The present thesis studies charging processes in laboratory settings where these processes can be investigated separately. In the first series of experiments focused on applications in the lunar or planetary surroundings, a single (charged) dust grain is stored in an electrodynamic trap and expose to electron and/or ion beams with variable energies and to photons from the UV source. We describe a procedure that allows a reliable determination of the work function of a single micrometer-sized lunar dust simulant and its dependence on the grain material and on the energy of UV photons. The interaction of the charged dust grains with solid surfaces is a subject of the second series of experiments. These experiments are based on laboratory investigations of the response of a scaled down model of the Cassini spacecraft to impacts of submicron iron grains accelerated to velocities 5-25 km/s with a motivation to help in a detailed analysis and interpretation of signals provided by the RPWS (Radio Wave Plasma Science) spacecraft instruments. The observed impulse signals were attributed to dust impacts onto RPWS antennas or a spacecraft body. The thesis discusses a whole experimental set-up, its limitations, and presents the results measured with both monopole and dipole antenna configurations. We demonstrate that the amplitude and polarity of the impulse signals recorded by antenna amplifiers depend on the voltages applied onto the antennas or the spacecraft body and briefly introduce the mechanism leading to the signal generation.