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Dust Charging: Electron Emissions in Laboratory Simulations

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Almost one percent of our galaxy consists of dust grains; objects of different shapes with a size distribution from micro to nanometers. In the space, a number of processes leads to their charging. Among them, the photoemission and electron and ion attachments are dominant. On the other hand, processes like electron or ion field emissions can limit the total grain charge. Our laboratory simulations of dust grain charging are performed inside a quadrupole trap where a single dust grain can be held and exposed to electron and/or ion beams for several days. This experimental approach allows us to separate individual charging process. A secular frequency of the grain motion in the trap makes possible to measure the charge-to-mass ratio and to calculate the grain surface potential. In this contribution, we survey results of our experiments with a special attention to an influence of electron field and secondary emissions from grains of various materials on their charge.