Charged properties of pyroxene grains in electron irradiation environment

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Abstract: The electrification of dust particles is a common phenomenon in the lunar surface and solar system space environment. It is an important basis for understanding the formation of lunar horizon glow and deep understanding the dust environment of lunar surface. In this study, pyroxene particles, which are representative particles in lunar soil and cosmic dust, are chosen to undertake the experiment of electric charge in an electron gun radiation environment. Based on the experimental results, it is found that micron sized pyroxene particles have electric charges of about 10^5 -10^8e and the 1-5 microns pyroxene particles are the most susceptible to electric motion. The electric quantity of charged pyroxene particles increases with the increase of particle size. There are also dramatic differences between particles of similar size due to different accumulation conditions. According to the maximum power fitting of pyroxene granule, it can be concluded that According to the maximum charged electric quantity fitting of pyroxene particles, it can be concluded that its maximum adsorption capacity is exponentially related to the size of particles, and is also related to the radiation electron energy. Finally, the maximum power model of dust particles in the lunar radiation environment is given by. According to the actual lunar surface conditions, the migration height of charged dust particles is predicted, and the most part of the charged movement of dust particles in lunar surface occurs in a few hundred meters. The results provide a reference for further understanding the electrostatic migration and dust environment of the lunar surface dust. A maximum charged power model of dust particles in lunar radiation environment is finally proposed by fitting the experimental data. According to the actual lunar surface conditions, the migration height of the charged dust particles is predicted, and the most part of the charged movement of dust particles in lunar surface occurs in several hundred meters. The results provide a reference for further understanding the electrostatic migration and dust environment of the lunar dust.

Keywords: pyroxene; charging; particle size; height of migration; Moon