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Implantation range of ions in carbon dust grains – influence on field ion emission

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Dust in space is often exposed to beams of energetic ions. These beams can charge the grains to large surface potentials via ion attachment and ion implantation. We have found that the discharging of grains charged by energetic ions is driven through field desorption of the beam ions and thus, it is limited by diffusion of implanted ions toward the grain surface. Consequently, the implantation range of the beam ions is an important factor influencing the discharging current. We computed the ion ranges in spherical glassy carbon dust grains using the TRIM code. The results are used for estimation of diffusion coefficients to interpretation of our measurements of field ion emission from single dust grain charged by the on bombardment. Since the sputtering of dust grains is considered as a significant source of heavy species in space plasma, we also applied the TRIM code to determination of the sputtering rate and compare the results with laboratory experiments.