Geophysical Research Abstracts
Vol. 14, EGU2012-1681, 2012
EGU General Assembly 2012

Glassy dust grain – field emission when charged by electrons and ions

M. Vysinka, J. Vaverka, J. Pavlu, J. Safrankova, and Z. Nemecek

Charles University, Faculty of Mathematics and Physics, Department of Surface and Plasma Science, Prague, Czech Republic (vysinkam@seznam.cz)

Dust grain in space can be exposed to energetic ion and electron beams and such conditions could lead to charging of the grain to a large surface potential. When the surface potential of grains with diameter around 1 micron reaches several kV the electric field gets the magnitude of 109 V/m leading to spontaneous discharging of the grain by field ion emission that limits the maximum grain charge. The large positive charge of the grain usually results from ion bombardment but, under some circumstances, it can be achieved by the electron bombardment as well. Making use of this fact, we have compared the discharging characteristics of the glass grain charged to the same positive potential under electron and Ar ion bombardments. Although it is generally expected that the field emission current is controlled by the surface electric field, both discharging profiles are different. It is interesting to note that the profile of the field emission current that results from electron charging of the glass grain is similar to that observed either ion charging of conducting materials (carbon or gold) that were investigated earlier. The paper discuss in detail possible causes of the observed differences, i.e. a contribution of the ion implantation, effects of the ion bombardment on the electronic structure of the grain material, etc.