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Martian soil simulant: Focus on secondary electron emission

Jiri Pavlu, Martin Beranek, Jakub Vaverka, Ivana Richterova, Jana Safrankova, and Zdenek Nemecek
Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic (jiri.pavlu@mff.cuni.cz)

Growing interest in dust charging physics is connected with several lander missions (running or planned) to the Moon, Mars, and Mercury. In support of these missions, simulations in laboratories are expected tools to optimize in situ explorations and measurements. In this paper, we have investigated some of the electrical properties of a Martian soil simulant (JSC Mars-1) using the dust charging experiment, where a single dust grain is trapped in a vacuum chamber and its secondary electron emission is studied. The exposure of the grain to the electron beam revealed that the grain surface potential is low and generally determined by a mean atomic number of the grain material at the low-beam energies (< 1 keV). Whereas it can reach a limit of the field ion emission being irradiated by energetic electrons (> 5 keV). Observations are also compared with our advanced numerical model of the secondary electron emission which takes into account (besides chemical content and dimension) an influence of shape and surface roughness.