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How can secondary electron emission from dust affect Martian atmosphere?

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Growing interest to Mars connected with recent and forthcoming missions led to numerous studies dealing with behavior of dust grains on the Martian surface and within its atmosphere. The present paper discusses electrical properties of a Martian soil simulant (JSC Mars-1) involving the dust charging experiment where a single dust grain is trapped and stored for a long time in a vacuum chamber and its emission characteristics, especially the secondary electron emission, are studied. The interaction of the grain with the intense electron beam showed the grain surface potential is generally low and determined by a mean atomic number of the grain material at a low-energy range (< 1 keV), whereas it can reach a limit of the field ion emission being irradiated by more energetic electrons. Experimental results are compared with numerical simulations showing a crucial influence of the grain shape and size in the range of higher (> 2 keV) electron energies. We further discuss possible implications of the secondary electron emission from dust grains for the generation of lightnings on Mars.