

Thermal Excitation of Charge Carriers: Effect on Charge Transfer between Particles of Different Size

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Abstract--Electrostatic charging of particles of different sizes but of identical composition is a poorly understood phenomenon. The effect may be of importance in dust storms, generation of lightning and agglomeration of particulates. In a previous paper, (reference below), we showed that under optical excitation the relative magnitude of surface to volume de-excitation gives size dependent concentrations of excited charge carriers, with resulting consequences on the direction of charge transfer between particles of different sizes. We show here that similar behavior occurs when excitation is induced by high temperatures, which can arise, for example, from mechanical friction or particle impacts. We discuss conditions when the concentration of excited charge carriers can increase or decrease with differences in particle size or surface morphology, and present concentration distributions for representative situations.

REFERENCES

J. C. Angus, I. Greber, K. Kash, "Size-dependent electron chemical potential: Effect on particle charging," *Journal of Electrostatics*, 71, 2013.