

The influence of dust particle geometry on its charge and plasma potential.

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The problem of determining the distribution of a potential around a dust particle has been investigated for a long time. Most articles on the topic are devoted exclusively to spherical dust particles [1], relatively few to rod-like particles [2, 3] and none to disk-like particles. In this work, a recently developed [4] self-consistent iterative molecular dynamic method for determining plasma parameters is demonstrated for different dust particle geometries. The charge of a dust particle is calculated from the equality of ion and electron fluxes on its surface. It is shown that in the case of collisionless plasma the charge of dust particles is determined only by their electric capacity, but in the case of a continuous medium (collisions are frequent) these charges differ – the larger the particles, the larger the charges (Fig .1). And yet, particles with different geometries but with the same electric capacity obtain the same charge values.

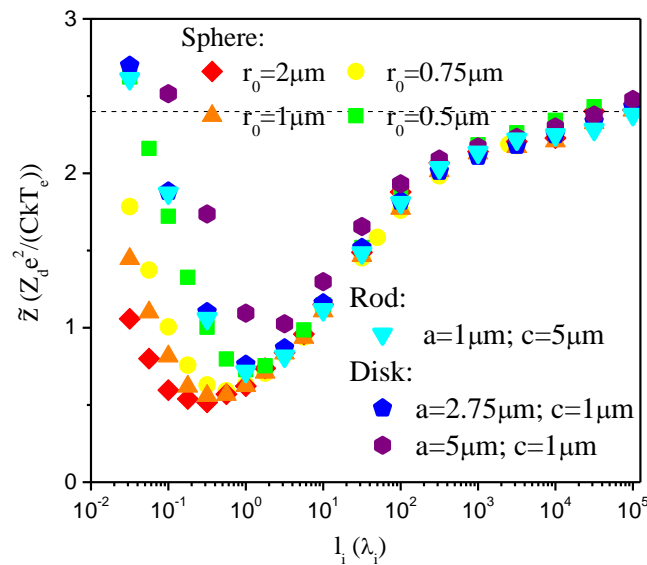


Fig.1. Dependence of a dust particle charge normalized to the capacity on ions mean free path.

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REFERENCES

- [1] S. Khrapak and G. Morfill, "Basic Processes in Complex (Dusty) Plasmas: Charging, Interactions, and Ion Drag Force". *Contrib. Plasma Phys.* **49**, 148 (2009).
- [2] A. V. Ivlev, A. G. Khrapak, S. A. Khrapak, B. M. Annaratone, G. Morfill, and K. Yoshino, "Rodlike particles in gas discharge plasmas: Theoretical model", *Phys. Rev. E* **68**, 026403 (2003)
- [3] B.M. Annaratone, A.V. Ivlev, V. E. Fortov, A.G. Khrapak, S.A. Khrapak, V.I. Molotkov, and G.E. Morfill, "Complex Plasmas With Rodlike Particles", *IEEE Transactions on Plasma Science*, Vol. **39**, No. 11, (2011).
- [4] G. I. Sukhinin, A. V. Fedoseev, M. V. Salnikov, A. Rostom, M. M. Vasiliev, and O. F. Petrov, "Plasma anisotropy around a dust particle placed in an external electric field. *Phys. Rev. E* **95**, 063207, (2017).