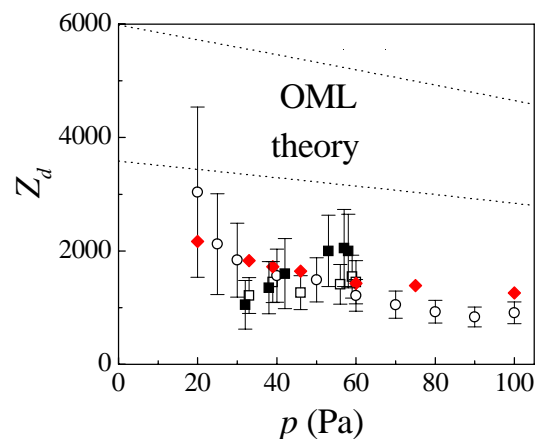


**Investigation of charging of micro particles in the quasineutral plasma of a DC discharge (PK-4 facility) has been carried out and confirmed the effect of ion-neutral collision.**

The particle charge is one of the most important characteristics of dusty (complex) plasmas, which determines, to name but a few, the interaction of a particle with the plasma electrons and ions, electromagnetic fields, interaction between the particles themselves, etc. Recently, experiments of particle charges have been performed in the PK-4 facility.

**FIG. 1:** The particle charge obtained from experiments [force balance for low number of injected particles (open circles); force balance for pressures above the threshold (open squares), solution of dispersion relation (solid squares)] and from MD simulations (red diamonds). The area between the two dotted lines corresponds to the charge given by the OML model for Havnes parameters between  $P=0.2$  (upper line) and  $P=3$  (lower line).



The charge of particles was determined experimentally in a bulk dc discharge plasma in the pressure range from  $\sim 20$  up to  $\sim 150$  Pa. The charge was obtained by two independent methods: One based on analysis of the particle motion in a stable particle flow and another on transition to unstable flow. The experiments with relatively small dust particles ( $0.6 \mu\text{m}$ ) were performed in ground based conditions. Some experiments with larger particles ( $1.7$  and  $3.4 \mu\text{m}$ ) were also performed in microgravity conditions during ESA 36<sup>th</sup> parabolic flight campaign (March, 2004). The experimental charges agreed well with results of molecular dynamics simulations of the particle charging carried out for conditions similar to those of the experiment (see Fig. 1). The charges obtained are considerably smaller than those predicted by the standard orbit motion limited theory (especially, at higher pressures). This provides a first experimental confirmation that ion-neutral collisions significantly affect particle charging. The results have been published in Refs. [1-2].

## References:

- [1]. S. Ratynskaia, M. Kretschmer, S. Khrapak, R. A. Quinn, M. H. Thoma, G. E. Morfill, A. Zobnin, A. Usachev, O. Petrov, and V. Fortov, Dust mode in collisionally dominated complex plasmas with particle drift, IEEE Trans. Plasma Sci., **32** (2), 2004
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