
# ICPDP

## 9th INTERNATIONAL CONFERENCE ON THE PHYSICS OF DUSTY PLASMAS

SPACE RESEARCH INSTITUTE (IKI)
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# MODELING OF BROWNIAN DYNAMICS OF MACROPARTICLES IN A PLASMA-DUST MONOLAYER UNDER THE INFLUENCE OF LASER RADIATION

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Using the molecular dynamics method, we have simulated the action of light pressure of laser radiation and the effect of the photophoretic force on a quasi-2D dust system with characteristics corresponding to experimentally observed ones in the high frequency discharge plasma. Numerical experiments have been performed for different values of the nonideality parameters of the dust subsystem. In the case of act of the force of light pressure force we have detected intensification of diffusion of macroparticles in the laser radiation region; the diffusion increases the more intensely the larger the initial nonideality parameter. For example, at Γ=156 and a radiation power of 1200 mW, the average kinetic energy of particles in the laser action region exceeds the initial diffusion by more than two times. For Γ=35 under the same conditions, the increase in the average kinetic energy of particles does not exceed 30%. It is found that as a result of interaction of macroparticles, their kinetic energy increases not only in the region of action, but also beyond its limits, where a more intense increase in the average kinetic energy is also observed for large values of the nonideality parameters. These processes directly depend on the radiation power and on the initial parameters of the system. In the case of act of photophoretic force it was found that the effect of laser radiation can lead to the appearance of the nature of particle motion inherent in the so-called active matter. In the work, the time dependences of the mean square and average linear particle displacements are calculated. It is established that when a photophoretic force acts on a colloidal dust system for the mean square displacement of particles in such a system, sections corresponding to ballistic, transition, and diffusion regimes are observed. Moreover, the average linear displacement for the particles is nonzero, which also characterizes them as active [1]. It also depends on the initial non-ideality parameter of the dust system and the power of the laser radiation acting on it.

## REFERENCES:

[1] Bichinger C., et al. Active particles in complex and crowded environments // Rev. Mod. Phys. 2016. V. 88. No. 4. P. 045006.