

Investigation of the Spin-motion of Alone Dust Particles in Plasmas of Different Inert Gases

Novikov L.A.^{1, @}, Dzlieva E.S.¹, Karasev V.Yu.¹,
D'yachkov L.G.² and Pavlov S.I.¹

¹ Saint-Petersburg State University, Universitetskaya Naberezhnaya 7/9,
Saint-Petersburg, 199034, Russia

² Joint Institute for High Temperatures of the Russian Academy of Sciences,
Izhorskaya 13 Bldg 2, Moscow, 125412, Russia

[@] leontiy.novikov@gmail.com

This paper presents the results of an experimental study of the rotation of alone glass microspheres in the plasma of inert gases: helium, neon, and argon. Based on an analysis of the obtained data, a physical model is proposed in which the rotation arises from the interaction of an asymmetric ion flow with defects and irregularities on the particle surface. Using the expression derived for the angular velocity in the proposed model, numerical estimates are obtained for the angular velocity of the particle's rotation, depending on the degree of surface imperfection, the radius of the spherical particle, and the plasma parameters. The numerical estimates yield values of approximately 3000 rad/s, which are consistent with experimental data.

The study was supported by the Russian Science Foundation grant No. 22-72-10004-II. <https://rscf.ru/en/project/22-72-10004-II/>.