

The velocity of self-rotation of dust particles depending on the type of inert gas

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Dust particles in a complex plasma can have their own rotation. They have a surface charge (up to 10^5 elementary charges), therefore they are magnetic tops. Complex plasma exhibits paramagnetic properties, since such magnetic tops are oriented along the external magnetic field. Thus, studying the self-rotation of dust particles is of significant scientific interest.

At the moment, quite a lot of experimental material on the study of self-rotation, both in a direct current discharge and in an RF discharge has been collected. It was shown that the magnetic field does not have a significant effect on the velocity of the dust particle's self-rotation, contrary to theoretical estimates made by the authors earlier. Also, the expected dependence of the rotation velocity on the type of inert gas was not revealed.

This work proposes a modified model that explains the appearance of self-rotation of dust particle depending on the discharge current (or the power put into the discharge in an RF discharge) and the pressure of gas. According to the new concept, there should be no noticeable change in the angular velocity of the dust particle's self-rotation depending on the mass of the inert gas, which is consistent with experimental data.

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