

RE-SCREENING OF A POSITIVELY CHARGED MACROPARTICLE IN PLASMA

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Charging of a spherical macroparticle in plasma is considered in the hydrodynamic approximation under assumption that the ionization and recombination processes in the disturbed region around the macroparticle are neglected. Thus, it is supposed that a source of plasma compensating its losses at the macroparticle surface is located somewhere at large distance. As is well known, if the electron emission from the macroparticle surface is absent it acquires a negative charge Z_d as a result of significantly higher electron mobility in comparison to positive ion one. The electron emission (secondary, thermo-, or photoemission) leads to decreasing of the negative charge, and at high enough its intensity the macroparticle charge Z_d can become positive. In the present report, a parameter characterizing the intensity of the emission independently on its mechanism is introduced, and a criterion of the charge sign change is obtained. Behavior of the potential around a macroparticle at large distance is considered and it is shown that the potential has the Coulomb asymptotic with some effective charge Z_{eff} , which is always negative independently of the sign of Z_d . So, the re-screening of the positively charged macroparticle occurs, the potential changes its sign and passes through the minimum. This points to possibility of the existence of the attraction between positively charged macroparticles. From large distance any macroparticle looks negatively charged what is a consequence of the higher mobility of electrons in comparison to ions in the plasma flow absorbed by the macroparticle, and the influence of the electron emission does not overstep the bounds of the screening cloud.