Wake effect on motion of the different size microparticles in plasma sheath

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Recently, interest in systems in which the symmetry of interaction is violated has increased. An example of such a system is a complex plasma. The ion flow is modulated by a negatively charged microparticle so that a region of increased ion concentration, an ion wake, arises behind it [1]. Neighboring microparticles interact both directly with the first and with the ion wake. In addition, the charge of a microparticle within the ion wake decreases due to extra ion flow to its surface [2]. This paper presents studies of the motion of microparticles of two sizes in the near-electrode layer of a high-frequency discharge. First, a flat layer of particles with a diameter of 10.41 μ was formed. A small amount of 7.17 μ diameter particles was then added. The motion of a single smaller microparticle above a layer of larger microparticles, as well as microparticles in this layer, was studied using three-dimensional diagnostics by binocular vision [3]. The microparticle of the lower layer, located directly under the upper particle, has descended by 0.2 mm due to the decrease in charge. The upper particle performed a continuous rotational motion. The microparticle of the lower layer, nearest to the upper one, follows the movement of the upper particle with some delay. Analysis of this motion, as well as oscillations of microparticles in the vertical direction, allows us estimate the force of attraction to the ion wake and the reduction in the charge of the lower particle, which reached 7%.

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