HOMOGENEITY OF COMPLEX PLASMA IN THE NOVEL PLASMA CHAMBER WITH SEGMENTED ELECTRODE DESIGN

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The purpose of this work was experimental study of homogeneity of a complex plasma in the "Ekoplasma" installation. The core of the "Ekoplasma" is the large cylindrical plasma chamber with parallel, RF driven electrodes. Each electrode consists of internal disc-shaped segment surrounded by external ring. Amplitude of RF voltage applied to internal U_{int} and external U_{ext} segments can be varied independently. Typical magnitude of RF voltage is 20-200 V. Gas pressure can be regulated from 0.1 Pa to hundreds of Pa. At pressures, close to low boundary of the working range, one can consider complex plasma as a virtually undamped system and carry out some experiments with great accuracy, e.g. determination of shear viscosity, linear acoustic waves propagation. Melamine microparticles with the diameter of 7.01 μm were injected into discharge by dispenser mounted in the chamber wall. The microparticles formed disc-shaped monolayer structure located near center of the low electrode. Upper electrode was removed and metal upper flange was replaced with optical transparent one, which allowed to carry out optical particle diagnostics. The microparticles illuminated by a laser beam shaped to a thin sheet was recorded by a digital camera which principal axis was directed perpendicular to the plane of the dust structure. Voltage U_{ext} was stepped up from 20 to 120 V, while U_{int} remained constant and equal to 100 V. The higher U_{ext}, the wider area dust structure occupy. When U_{ext} reached 120 V microparticles scattered toward the electrode edge. The dependencies of the number density upon the distance from the center of the electrode were revealed at different conditions. The conditions for maximum size of homogeneity area were found. It is shown that the same conditions lead to the minimum number of crystal lattice defects. The proportion of defects reaches the minimum value of 5.5% at $U_{ext} = 115$ V.

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