Surface modification of MF-R particles in a stratified glow discharge in neon

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Complex plasma as in radio frequency discharge, as in stratified glow discharge is an extremely interesting object of experimental and theoretical studying. Surface modification of polymer microparticles (spherical particles with diameters in the micrometer range) in dusty plasma is now becoming an important area of these researches also new applications of plasma-processed dust particles are emerging [1,2].

Changing in surface structure of MF-R spherical particles (11.6 ± 0.4 μm in diameter with a density of 1.5 g/cm^3) in the positive column of a direct current gas discharge (Ne, p=25 ±5 Pa, i = 2.1 ± 0.2 mA) in a cylindrical glass tube has been studied experimentally. Also the change of the microparticles diameter (before their complete degradation) depending on the residence time of particles in the dusty plasma was established. Melamine formaldehyde microparticles were injected into a vertically disposed discharge tube fell into the traps, localized in the region of the striations [3,4]. The particles in the traps were exposed to dusty plasma for a predetermined time. An analysis of the modification of microspheres was carried out using the Merlin Zeiss scanning electron microscope. When processing the 2D imaging with nanometer resolution, we used the Smart Tiff (ZEISS) and the Gwyddion (software for analyzing the height fields and images). Experiments show that surface of polymer particles were heated to a melting point (350°C) which is much higher than the neon plasma temperature. The flow of ions bombarding the particles warmed their surface and affected its texture. After 40 min of plasma exposure, the particles completely degenerated by losing their spherical shape and about half of their mass.

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