DUSTY PLASMA WITH MICRO- AND NANOPARTICLES IN A PULSED RF DISCHARGE

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In this work experimental results on the study of the structural properties of dusty plasma with microparticles and results on the plasma-chemical synthesis of carbon nanoparticles (PECVD) in a RF discharge in the signal modulation mode are presented.

Plasma containing a structure of microparticles with two different diameters showed a strong dependence on the parameters of the RF modulated voltage [1]. It was also found that pulse-time modulation of the RF voltage allows the temperature of the electrons in the plasma to change. Since the temperature of the electrons dominates the charging of the dust particles, it was shown that the position of the dust particles can be changed using pulse-time modulation. Moreover, with the help of modulated RF plasma it became possible to separate microparticles. Thus, as the experimental results show, it is possible to remove larger particles from the plasma, while smaller particles remain.

Carbon nanoparticles were also synthesized using RF discharge plasma in pulsed mode to control the size of the nanoparticles. Experimental observations showed that the size of the carbon nanoparticles increased with increasing pulse signal frequency. It was also found that using a frequency-modulated pulsed RF signal, the size of carbon nanoparticles in the range of 40-70 nm can be controlled. The plasma-enhanced chemical vapor deposition method is the main mechanism of nanoparticle growth. Analysis of transmission electron microscopy images revealed two types of nanoparticles, some of which are agglomerates of nanoparticles with an amorphous structure, while others are nanometer-sized with a crystalline structure. It was also found that changing the modulation frequency and synthesis time allows different films with different surface characteristics to be obtained [2].

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