15th International Conference on the Physics of Non-Ideal Plasmas Almaty, August 30- September 4, 2015

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Al-Farabi Kazakh National University

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Spectroscopic diagnostics of Ar/CH_4 and Ar/C_2H_2 complex plasma

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In nowadays there are various well known methods and technologies for production of nanoparticles. Nevertheless, the studies of their growth mechanism and formation in plasma environment are still actual problem. Plasma-chemical processes influence on the plasma optical radiation. Diagnostics of the emission spectrum of the plasma is the one of the methods for investigation the processes occurring in it. Nowadays, methods of the optical diagnostics of plasma have a great development. Spectral diagnostics provides significant information about the parameters of dusty plasma (temperature, concentration of plasma particles) and allows to reach the more detailed understanding of the physical processes in the system, because the advantage of this diagnostics is its non-contact character. In this paper we carried out the study of optical properties of complex plasma in the gas mixture of Ar/CH_4 and Ar/C_2H_2. According to the obtained results of optical diagnostics we found the optimal condition of growth and formation of carbon nanoparticles and nanofilms, and also the effect of the dust component on the spectral characteristics of the buffer plasma. The growth and formation mechanisms were also studied in dependence of percentage of gases in the mixture of Ar/CH_4 and Ar/C_2H_2.

The experimental setup was described in detail in the previous works [1-2]. The working chamber has lateral windows for monitoring the processes in the plasma of RF discharge. The optical system for plasma diagnostics consists of the lens system and spectrometer. The lens system is fixed to provide a clear image of the interelectrodes space on the entrance slit of the spectrometer [3].

Thus, the electron temperature varies for Ar/CH_4 plasma in the range of 1 – 3.0 eV, for Ar/C_2H_2 plasma in the range of 1 – 4 eV at different values of pressure 0.1 – 1 Torr and power 1 – 50 Watt.

References

[1] Ramazanov T.S., Dzhumagulova K.N., Jumabekov A.N., and Dosbolayev M.K., // Phys. Plasmas. – 2008. - №15. – P. 053704.

[2] T. S. Ramazanov, A. N. Jumabekov, S. A. Orazbayev, M. K. Dosbolayev and M. N. Jumagulov // Phys. Plasmas. – 2012. №19. P. 023706.

[3] S. A. Orazbayev, M.M. Muratov, T. S. Ramazanov, M.K. Dosbolayev, M. Silamiya, M. N. Jumagulov, and L. Boufendi The Diagnostics of Dusty Plasma in RF Discharge by Two Different Methods // Contrib. Plasma Phys. – 2013. - V. 53, № 5. - P. 436 – 441.