The effect of pulsed RF discharge on complex plasma parameters

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In this work experimental and simulation results of investigation of complex plasma parameters in continuous and pulsed RF discharge are presented. Pulsed discharges have a wide range of advantages, for instance, they affect the orbit of etching ions, reduce the damage of substrates, reduce the heating quantity of substrates, and save the source energy. Such RF discharges were used to deposit super hydrophobic coatings, which attracted the interest of many researchers and applicators [1-3].

In the experimental part of this work plasma parameters, such as axial distributions of electron temperature and ion density of plasma of the continuous and pulsed RF discharge were studied by probe diagnostics at different modulation frequencies and duty cycles. It was revealed that a decrease in the modulation frequency with 50% duty cycle of RF signal leads to the reduction of the electron temperature. The influence of the modulation frequency on the ion density is observed only at comparatively large values of pressure.

In the simulation part the continuous and pulsed RF discharge is described by the Particle-in-Cell simulation incorporating Monte Carlo treatment of collision processes (PIC/MCC) [4-5]. The pulsed RF discharge was found to result in a decreased electron temperature and plasma density. This is because, during one pulse period, the time of the pulsed RF discharge is shorter than the time of the continuous discharge, thus the plasma in the pulsed discharge obtains far less energy from the electric field.

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