

ELEMENTARY PROCESSES IN ARGON SURFACE-WAVE-SUSTAINED PLASMA TORCH AT ATMOSPHERIC PRESSURE

Plamena Marinova¹, Evgenia Benova²

¹*Faculty of Forest Industry, University of Forestry, Sofia, Bulgaria*

²*DLTIS, Sofia University, Sofia, Bulgaria*

The microwave discharges of various types operating at atmospheric pressure usually produce non-equilibrium plasma that can be used for biological systems treatment. In many cases, the treatment should be carried out without thermal damage while providing a high active particles concentration and UV radiation to have for example efficient bactericidal effect. The aim of this work is theoretical investigation of surface-wave-sustained discharge produced in Argon at atmospheric pressure.

The self-consistent model of surface-wave-sustained discharge in argon at atmospheric pressure has been improved by taking into account the variation of electron–neutral collision frequency for momentum transfer with plasma density along the plasma column. The axial profiles of the plasma parameters have been presented in the case of varying electron–neutral collision frequency along the plasma column.

The opportunity to investigate the surface-wave-sustained discharge by self-consistent model allows us to presume the adequate discharge conditions in order to sustain the plasma torch with certain plasma parameters according to the applications. Plasma parameters can be easily optimized by changing the radii, the thickness and the dielectric permittivity of the discharge tube. Also by means of varying the electromagnetic wave power and the gas flow, is possible. Thus optimal plasma parameter for given application can be obtained.

The influence of the plasma parameters on the argon ions density, excited argon atoms density has been studied.

In the argon energy levels population the influence of the discharge parameters is observed. However practical applications require detailed knowledge of the discharge characteristics on the discharge conditions, more precisely density profiles of the plasma constituents – electrons, excited species and ions as well as the rate coefficients of the main elementary processes in the gas discharge. Such knowledge can be provided in economical and reliable way by a self-consistent model.

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References:

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