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## MICROWAVE PLASMA GENERATOR FOR MODIFYING PROPERTIES OF ORGANIC FILMS<sup>\*)</sup>

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Due to its biocompatibility and biodegradability, chitosan has attracted considerable attention in biomedical applications in recent years [1]. A number of studies indicate that the surface of chitosan membrane exhibits hydrophobicity properties [2]. For biomedical applications, the hydrophilicity of the surface is important for tissue regeneration. Vacuum plasma techniques have been used to modify the surface of polymeric materials because of their high process efficiency and homogeneity. The most important feature of this approach is the modification of the polymer surface without changing its volumetric characteristics [3].

This paper describes an experimental setup for the treatment of substrate surfaces in a plasma flow based on resonant microwave discharge.

The discharge is initiated in a low-pressure working gas flow (Ar, or Ar-N<sub>2</sub>-H<sub>2</sub> mixture, pressure range 10<sup>-4</sup>...10<sup>-2</sup> Torr) in the quartz tube (diameter 60 mm) axisymmetric with a cylindrical cavity excited on the H<sub>111</sub> mode and magnetostatic field coils. The cavity of original design with two orthogonal pinned energy inputs allows to control the polarisation of the standing wave is equipped with cylindrical ultimate waveguides to eliminate microwave radiation losses. The microwave generator with a frequency of 2.45 GHz and adjustable power up to 3.0 kW can operate in continuous and pulse modes. The electromagnet system axisymmetrical to the cavity and plasma flow allows to change the magnetic field induction and its spatial distribution.

The plasma flow through the quartz tube leaves the cavity and reaches the volume of sample placement inside the stainless steel working chamber with a volume of 1.3 m<sup>3</sup>. A carousel-type system insert in the working chamber intended to accommodate up to six organic film samples mounted on glass substrates facing the plasma flow. It is possible to regulate the distance from the quartz tube cut-off to the sample within 0.1...1 m.

Diagnostics of the plasma flow is carried out by partial and optical methods. In the areas of plasma flow falling on the target, it is possible to perform measurements with a dual probe and a multigrid analyser. The method of emission spectroscopy allows us to obtain plasma parameters from the measurements of relative intensities of emission lines. For these aims, a fiber channel for transferring radiation from the plasma flow to the monochromator-spectrograph with a diffraction grating is organized.

Chitosan films treated with plasma flow are examined for surface damage by microscope and profilometer. Changes in its molecular structure are determined by IR spectrophotometry. Direct measurement of the wetting edge angle of the films is performed. Additional analytical and diagnostic techniques are being implemented.

The results of preliminary experiments showed the dependence of the parameters of the treated films on the regimes of plasma flow generation.

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<sup>\*)</sup> [abstracts of this report in Russian](#)