SURFACE PROPERTIES OF POLYLACTIC ACID FILMS AFTER PLASMA TREATMENT

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Polylactic acid is a biodegradable, aliphatic polyester of lactic (2-hydroxypropionic) acid and widely used for medical purposes. Plasma modification of surface allows to change the surface properties (adhesion, wettability) of films and to sterilize the polymer films.

The aim of this work is the study of low temperature plasma influence on the polylactic acid films surface properties.

Materials and methods. The polylactic acid films were obtained by dissolving of polylactic acid PL10 (PURAC, Netherlands) in a solvent of trichloromethane (CHCl3) (EKOS-1, Russia). The resulting 1% solution in an amount of 10 g was poured into Petri dishes and left for 2-3 days. The films thickness was 20±0,1 μm. The plasma modification of polylactic acid films was done with using the experimental low temperature plasma device. The plasma treatment time of each film surface was 30, 60 and 90 seconds. The surface topography and the roughness of polylactic acid films were studied on atomic force microscopy (AFM) "Solver-HV".

Results. The polylactic acid films had two different sides: front side was more relief, backside was smoother. The inner side of the film had a smoother surface (fig. 1). Ra of polylactic acid films varied from 0.01 to 0.018 μm within the error range from 0.003 to 0.005 μm.

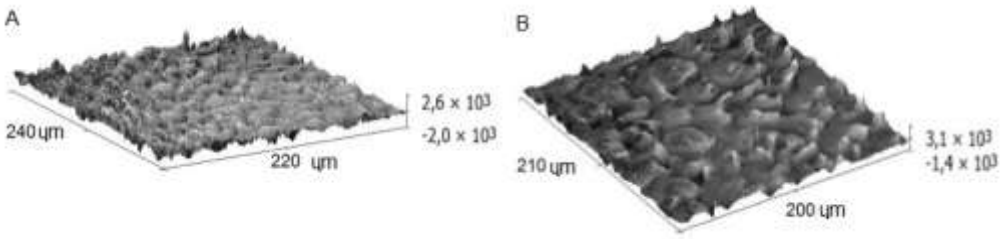

Fig. 1. The polylactic acid films surfaces: a – inner surface; b – outer surface.

The plasma increased the roughness of polylactic acid films by 2.4 times (plasma treatment time was 90 seconds). The asymmetry parameter of all samples was Rsk<|1.5|.

All samples had the left side asymmetry.

The analysis of the obtained data showed that the films had a wetting angle θ = 80 ° and their properties were close to hydrophobic. The surface energy of the films varied in the range of 26-27 mJ / m^2. The contribution of the dispersion component was more significant than the polarization one. The polarity of the polylactic acid films was 0.36. The plasma decreased the wetting angle of the polylactic acid films by 1.5 times.

Conclusion. The polylactic acid films have two different sides: front side was more relief, backside was smoother. The low temperature plasma modification contributes to increase the surface roughness and decrease the wetting angle of the polylactic acid films.

The research was conducted with the financial support of the Russian Foundation for Basic Research (RFBR) as part of the project № 18-315-00048.