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This book comprises the abstracts of the reports (presentations) for the oral and poster sessions of VII International Congress on Energy Fluxes and Radiation Effects (EFRE-2020 online). Due to the unfavorable epidemiological situation associated with the COVID-19 pandemic, the Congress was held in a remote format using modern information technologies. The Congress incorporated together four international meetings: International Symposium on High-Current Electronics, International Conference on Modification of Materials with Particle Beams and Plasma Flows, International Conference on Radiation Physics and Chemistry of Condensed Matter, and International Conference on New Materials and High Technologies. It will be a good platform for researchers to discuss a wide range of scientific, engineering, and technical problems in the fields of pulsed power technologies; ion and electron beams; high power microwaves; plasma and particle beam sources; modification of material properties; pulsed power applications in chemistry, biology, and medicine; physical and chemical nonlinear processes excited in inorganic dielectrics by particle and photon beams; physical principles of radiation-related and additive technologies; self-propagating high-temperature synthesis; and combustion waves in heterogeneous systems.

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SURFACE MODIFICATION OF PLLA SCAFFOLDS BY REACTIVE MAGNETRON SPUTTERING CONTROLS THE RELEASE OF AN INCORPORATED DRUG*

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In this paper, the effect of surface treatment of polymer scaffolds by the method of reactive magnetron sputtering on the release of an incorporated drug is studied. Drug-loaded polymer scaffolds were treated by magnetron sputtering in order to change the drug release profile [1]. The objects of research are polymer scaffolds obtained by the method of electrospinning from a poly-L-lactide solution and chloramphenicol as a model drug. Before modification, obtained scaffolds were placed into a vacuum chamber and left for 10 hours to remove residual solvents.

To modify the surface, a magnetron sputtering system was used: the vacuum chamber with a horizontally oriented magnetron [2], a chemically pure (99.99%) titanium (Ti) target. Surface modification was carried out under the following technological conditions: working pressure 99.99% N_2 – 0.7 Pa, current – 0.2 A, distance between target and sample – 40 mm, sprayed target area – 240 cm^2, modification time – 30 sec.

Figure 1 presents data of chloramphenicol release from both treated and untreated scaffolds.

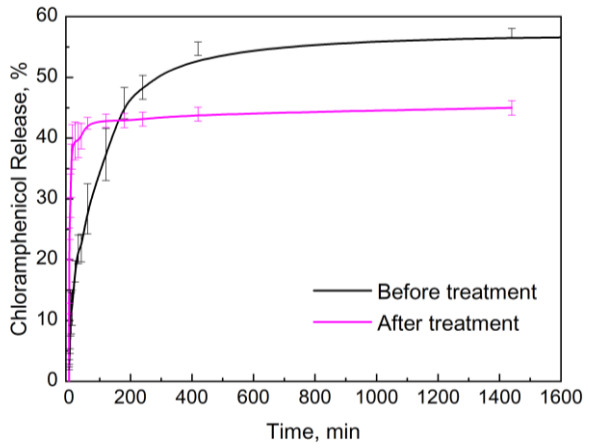

Fig. 1. Drug release from the polymer scaffold before and after magnetron sputtering treatment

Modification allows to increase the amount of released drug in the first 200 min of the experiment, however, further release is obviously hindered. Untreated samples demonstrate a steadier release reaching a plateau only by 500 min of the experiment. Maximum amount of a released drug decreases from 56 wt.% to 43 wt.% average in untreated samples compared to treated ones correspondently.

It was shown that the treatment of the obtained materials with magnetron sputtering does not lead to the destruction of the fibers and a change in their morphology and surface wettability; the crystallinity of the scaffold material does not change. Magnetron sputtering treatment changes the release profile of chloramphenicol from electrospun PLLA scaffolds. Results can be used for designing of new solid dosage forms design with controlled release.

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