

## PULSED E-BEAM IRRADIATION TO MODULATE DRUG RELEASE FROM FIBERS\*

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Drug-loaded electrospun fibers have been an object of interest for several decades now. Possibility of a steady, controlled drug release combined with extracellular matrix features have made them widely investigated topic of research.

Synthetic biodegradable polymers are the most used sources for drug-loaded fiber production. Their advantages are: accessibility, high mechanical strength, predictable chemical interactions with body fluids and low immunogenicity. High molecular weight polymers are easier to process via electrospinning. However, high molecular weight of the polymer could affect drug release rate.

Several material modification methods are shown to modulate drug release dynamics [1]. We have previously demonstrated how electron-beam irradiation of electrospun drug-loaded scaffolds can increase drug release rate [2,3]. In this work we present results of the study of the drug release kinetic parameters and overall material properties dependence on the absorbed irradiation dose.

Poly( $\epsilon$ -caprolactone) scaffolds with an incorporated chloramphenicol were the object of the research. Pulsed e-beam irradiation with doses 0, 25, 50 and 75 kGy were applied. Irradiation leads to changes in the molecular weight of the polymer and its crystallinity. Drug release profiles also change after modification. It has been demonstrated that the observed effects are dose and drug concentration dependent.

## REFERENCES

- [1] A.A. Volokhova, D.A. Fedorishin, A.O. Khvastunova, T.I. Spiridonova, A.I. Kozelskaya, J. Kzhyshkowska, S.I. Tverdokhlebov, I. Kurzina, Reactive Magnetron Plasma Modification of Electrospun PLLA Scaffolds with Incorporated Chloramphenicol for Controlled Drug Release. *Polymers*, vol. 14, 2022.
- [2] A. A. Volokhova, V. L. Kudryavtseva, T. I. Spiridonova, I. Kolesnik, S. I. Goreninskii, R. V. Sazonov, G. E. Remnev, S. I. Tverdokhlebov "Controlled drug release from electrospun PCL non-woven scaffolds via multi-layering and e-beam treatment," *Mater. Today Commun.*, vol. 26, 2021.
- [3] A.A. Rakina, T.I. Spiridonova, V.L. Kudryavtseva, I.M. Kolesnik, R.V. Sazonov, G. E. Remnev, S.I. Tverdokhlebov. Ibuprofen controlled release from E-beam treated polycaprolactone electrospun scaffolds. *Jour. of Phys.: Conf. Ser.*, vol. 1115, n. 3, p. 032051, November 2018

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