

## Jury Member Report – Doctor of Philosophy thesis.

**Name of Candidate:** Pavel Proshin

**PhD Program:** Materials Science and Engineering

**Title of Thesis:** Films with pattern-placed drug for use in personalized medicine

**Supervisor:** Professor Gleb Sukhorukov

**Co-supervisor:** Professor Alexander Korsunsky

**Name of the Reviewer:** Vesselin N. Paunov

I declare the absence of conflict of interest	<b>Date: 18 October 2024</b>
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*The purpose of this report is to obtain an independent review from the members of PhD defense Jury before the thesis defense. The members of PhD defense Jury are asked to submit signed copy of the report at least 30 days prior the thesis defense. The Reviewers are asked to bring a copy of the completed report to the thesis defense and to discuss the contents of each report with each other before the thesis defense.*

*If the reviewers have any queries about the thesis which they wish to raise in advance, please contact the Chair of the Jury.*

### Reviewer's Report

Reviewers report should contain the following items:

- Brief evaluation of the thesis quality and overall structure of the dissertation.
- The relevance of the topic of dissertation work to its actual content
- The relevance of the methods used in the dissertation
- The scientific significance of the results obtained and their compliance with the international level and current state of the art
- The relevance of the obtained results to applications (if applicable)
- The quality of publications

The summary of issues to be addressed before/during the thesis defense

The dissertation is well-organized, with relevant sections for the introduction, literature review, methodology, results, and discussion. The author briefly outlines the current state of the field, followed by the development of the methodology and detailed experimental work. Each section is self-contained but is connected with the previous one, which improved the readability of the thesis.

The student has, focused on the development of drug-eluting coatings for medical implants and devices, which is highly relevant to development of novel biomedical applications in the area of controlled and targeted drug delivery. It addresses a critical issue in personalized medicine by improving drug delivery systems for various medical applications. The research problem is well-defined in the thesis and is aligned with the experiments and proposed solutions.

The practical relevance of the work is highlighted through its focus on developing coatings for medical implants. Emphasis on scalability, sterilization processes, and clinical applications, like antimicrobial coatings for prostheses, demonstrates the potential for real-world impact. Given the thorough experimental work and the innovative technological approaches, the research is likely to lead to high-quality publications.

The methods employed—such as laser perforation, 3D printing, porogen addition, and techniques like UV-Vis spectrometry, SEM analysis, and drug release kinetics—are well-suited for confirming the hypotheses in the study. The methods employed by the student allow the investigation of controlled drug release mechanisms, optimization of polymer formulations, and adjustments to drug elution profiles.

Several issues to address before or during the thesis defense include:

- 1) What is the rationale for selection of the particular polymers used by the student in this thesis.
- 2) How do variations in polymer composition (e.g., molecular weight, degree of crosslinking) influence drug retention and release kinetics, and were these factors considered in your study?
- 3) Could alternative techniques, such as (i) incorporation of other inclusions, like magnetic nanoparticles, (ii) chemical etching, (iii) sonication or other mechanical methods, achieve similar controlled release profiles instead of laser perforation?
- 4) How does the sterilization process, particularly electron beam irradiation, affect the mechanical properties of the films and their clinical performance? Have you checked whether this does not degrade the drug during sterilization?
- 5) What is the cost effectiveness and the perspective for clinical application of these materials ?

**Provisional Recommendation**

*I recommend that the candidate should defend the thesis by means of a formal thesis defense*

*I recommend that the candidate should defend the thesis by means of a formal thesis defense only after appropriate changes would be introduced in candidate's thesis according to the recommendations of the present report*

*The thesis is not acceptable and I recommend that the candidate be exempt from the formal thesis defense*