

## 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:** Dmitry Gorin

I confirm the absence of any conflict of interest



**Date:** 14-10-2024

### Reviewer's Report

The thesis is well-structured, presenting a clear and logical progression from the introduction of the problem, through experimental design and methodology, to the results and their interpretation. The dissertation is organized into coherent sections, with each chapter building upon the previous one, leading to a comprehensive understanding of the research topic. The topic of the dissertation is relevant and well-aligned with its content. The focus on drug loading and release from polymeric matrices, specifically using PLGA films, addresses a significant area in the field of drug delivery systems. The detailed exploration of vancomycin release kinetics and the comparison of various mathematical models to fit the release data underscore the pertinence of the research to contemporary biomedical applications. The methods employed in the dissertation are appropriate and relevant to the research objectives. The use of Dissolution Data (DD) solver for kinetic studies, alongside the empirical testing of coating quality and film thickness, demonstrates a robust methodological approach. The experimental procedures, including SEM imaging and UV-Vis spectroscopy, are effectively implemented to gather and analyze data. The scientific significance of the results is substantial. The thesis provides valuable insights into the kinetic release mechanisms of vancomycin from PLGA films, contributing to the broader understanding of drug delivery systems. The findings are consistent with the current state of the art. The demonstrated release curves showed an absence of notable burst release, indicating a controlled and sustained release profile, which is crucial for maintaining therapeutic drug levels over an extended period. The technology obtained have significant practical implications for the field of drug delivery. The control of drug release kinetics is crucial for the development of effective drug delivery systems. The demonstrated ability to modulate the release of vancomycin and model dyes through the manipulation

of PLGA film properties highlights the potential for real-world applications in medical treatments, particularly for bacterial infections.

The quality of publications stemming from this dissertation is commendable. The research has been presented in reputable international journals, indicating a high level of scholarly achievement. The publications effectively communicate the research findings to the broader scientific community, contributing to the ongoing discourse in the field of drug delivery systems.

#### Summary of Issues to be Addressed Before Thesis Defense

*While the thesis is comprehensive and well-executed, there are a few issues that should be addressed before the thesis defense:*

- 1. Provide more detailed explanations of the experimental procedures, particularly of laser ablation setup used in experiments;*
- 2. Add a more detailed comparative analysis of the kinetic models used, explaining why certain models performed better than others;*
- 3. Some figures have been presented without error bars for example Figure 4.3, Figure 4.4 (d), Figure 4.14, Figure 4.21 etc. Please add the error bars where it is possible to do it;*
- 4. Would be useful to add the paragraph with description the perspectives or by other words the vision of future work to the conclusion part of this thesis.*

The summary of draft-related issues:

- 1. Perhaps some heading levels should be reconsidered.*
- 2. Many errors in captions for pictures (Fig. 4.4, 4.5...)*
- 3. Some technical notes were not removed from the draft.*
- 4. There are broken references to literature*
- 5. Some graphs should be increased in size*

Overall, the dissertation represents a significant contribution to the field of material science and engineering for elaboration of the smart drug delivery systems with remote controlled properties.

#### **Provisional Recommendation**

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