

## Jury Member Report – Doctor of Philosophy thesis.

**Name of Candidate:** Yuliya Kan

**PhD Program:** Materials Science and Engineering

**Title of Thesis:** Development of core-shell fiber composite based on polyvinyl alcohol modified with graphene oxide and silica for biomedical applications

**Supervisor:** Professor Alexander Korsunsky

**Name of the Reviewer:** Professor Dmitry Gorin

I confirm the absence of any conflict of interest

**Date: 15-12-2022**

*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

In his PhD thesis, Yuliya Kan, entitled “Development of core-shell fiber composite based on polyvinyl alcohol modified with graphene oxide and silica for biomedical applications”, describes a preparation of coaxial fiber composite, considering the impacts of silicon dioxide nanoparticles, graphene oxide (GO) as modifying additives and the polymer blend of PVA and polyethylene glycol (PEG) as well as study of mechanical properties of such type fibers, encapsulation and release of antibacterial (CHX), antibiotic (DOX) and fluorescent dyes. Moreover, the morphology, chemical structure and physical properties (rheological, electrical and mechanical) of synthesized fibers were investigated. This thesis is clearly written and well organized. The PhD thesis contains 5 Chapters. The Chapter 1 devoted to actuality and problem statement. Chapter 2 presents a critical review of recent published articles. The quality of this review is very high because author critically analyzed the articles and formulated a brief conclusion after very subchapter. Table 1 and 2 contains a very important information about different model of drug release. Chapter 3 is methodological one, where sample preparation, and also characterization methods have been carefully described. The results were considered and discussed In Chapter 4. Last chapter 5 of PhD thesis contains the conclusion remarks. The bibliography list consists of 184 references.

I think that main results of this work are related to control over both fiber dimensions as well as their mechanical properties using fiber modification by nanomaterials. The other remarkable results are connected with determination of drug release model for core-shell fiber composite. It was demonstrated that the core-shell fiber composite showed the best correlation with the Higuchi and Korsmeyer – Peppas models. Obtained results can be considering in medical applications of such type of materials for prolongate release of encapsulated drugs for any types of implants. The text of PhD thesis is solid and is presented in a cohesive way. It presents novel scientific results in the areas of materials science.

The main part results of PhD thesis have been already published in the international journals including Materials Today Communications (IF=3.662), Nanomaterials (IF=5.719).

However, I have few comments to be addressed to the author for improve the quality of this PhD thesis:

1. Page 37, second paragraph from top, please add information about molecular weight (MW) of polymers because MW can affect significantly on the fiber properties.
2. Page 47, subchapter 3.2.3 Patteration of fiber mat, please add the pulse duration to the laser description
3. Page 69, please add the unit nm to “the diameter of fibers  $174 \pm 31$ ”
4. Page 74, Table 6. Raman bands assignments of GO, PVA, PEG, CHX, SiO<sub>2</sub>, please add the references or name of database that for type of band identification have been used.
5. Page 79, Table 7, FTIR bands attributed to the silica, graphene oxide and PVA, please add the references or name of database that for type of band identification have been used
6. Page 84, Figure 15, would be useful to give explanation of the reducing of melting temperature for core and core-shell composition from 227.4 °C to ca. 202 °C due to the amorphous silica and PEG presence.

After correcting some minor points mentioned above, I recommend that should defend the thesis by means of a formal thesis defense.

#### **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*