

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: Yuri Kotelevtsev

I confirm the absence of any conflict of interest (Alternatively, Reviewer can formulate a possible conflict)	Date: 14-12-2022
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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

- **Brief evaluation of the thesis quality and overall structure of the dissertation**

The thesis is written in canonical way in a very good English. The thesis is well structured and easy to read and examine. The body of the thesis comprises of 105 pages featuring 24 figures and 11 tables. The supplementary material is 20 pages which present essential data not incorporated in the main body. The reference list includes 184 citations.

- **The relevance of the topic of dissertation work to its actual content**

The thesis describes development of a new material, core-shell fiber composite based on polyvinyl alcohol modified with graphene oxide, followed by investigation of its properties relevant to biomedical applications. The content of the thesis exactly matches its title and initially approved programme of PhD investigation.

- **The relevance of the methods used in the dissertation**

The author mastered polymer electrospinning with subsequent modification of the core with hydrophilic polymers, graphene oxide and silica, to obtain required properties. The fiber spinning was followed with patterning and postprocessing, including crosslinking. Essential methodological part was characterization of obtained material using a set of imaging techniques, including optical and electron microscopy, x-ray diffraction (XRD), Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS). The set of methods used by Yuliya would be difficult to put under her belt in the best equipped laboratories internationally.

- **The scientific significance of the results obtained and their compliance with the international level and current state of the art**

The results of Yuliya studies are highly significant. She developed a new spun polymer with original modifications, graphene oxide and silica modification and crosslinking. What is most important, the material was carefully investigated for the drug delivery with several model compounds. The release was quantified which allowed careful investigation of release parameters which were best fit with the Higuchi and Korsmeyer – Peppas models. The author demonstrated that crosslinking modifications can control the drug release by fine tuning the fiber structure. The polymer-drug interactions allow to achieve prolonged drug release provided by transformation from semicrystalline fiber mat to a hydrogel.

• **The relevance of the obtained results to applications (if applicable)**

I have no doubt that described material will find application in biomedical research.

• **The quality of publications**

The proof of originality and novelty is in peer-reviewed publications. The main results are reported in a 20 page-long experimental paper publication in MDPI Nanomaterials (IF 4.66). The paper in Materials Today Communications, 2020, attracted attention of the researchers in the field and was already cited 6 times.

• **The summary of issues to be addressed before/during the thesis defence**

The thesis provides comprehensive analysis of chemical and physical properties of the material. The drug loading and release properties were investigated in full. The thesis will benefit from in vitro and in vivo toxicity and biocompatibility studies. It will be important to discuss with the candidate the Future developments of her research.

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

