

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Timur Ermatov

PhD Program: Physics

Title of Thesis: Optical properties of hollow-core microstructured fibers modified by polymers and/or inorganic nano- and submicron particles

Supervisor: Professor Dmitry Gorin

Name of the Reviewer: Professor Nikolay Gippius, Skolkovo Institute of Science and Technology, Moscow, Russia

I confirm the absence of any conflict of interest



Date: 28-09-2021

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

This thesis is devoted to the experimental investigation of functionalized optical fibers. Throughout the work, the author demonstrated the successful application of the layer-by-layer assembly technique for the modification of the fiber capillaries. The light guidance in the designed structures was characterized in the visible and Ir spectral ranges. The waveguiding losses were calculated using the cut back method. All the experimental findings were supported with the relevant theoretical calculations. Also, the author presents practical applications of the developed fiber-based sensors for the creation of an in-fiber multispectral refractometer.

The topic is interesting to the community and attracts a lot of scientific interest. In this regard, the major achievements of this study are the following: the controlled shift of the transmission windows position of hollow-core fibers through the deposition of polymer nanofilms, the realization of real-time in-fiber refractometry measurements, the control of the roughness of the deposited films, in-situ monitoring of coating performance. The results were published at the peer review international level optics journals, such as "*Light: Science and Applications*", "*Optics Letters*" and "*Optics Express*".

Regardless of the general position evaluation of this thesis, I found few weak points to be addressed before the defense:

1. The introduction section describing different types of microstructured optical fibers should be extended.
2. More comparative data needs to be included, especially referring to the novel fiber-based sensors which were announced or published recently.
3. The summary section can include more discussion about future research

Therefore, I recommend that the candidate 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