Skoltech
Skolkovo Institute of Science and Technology

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Anastasiia Merdalimova

PhD Program: Physics

Title of Thesis: Optical Sensors Based on Hollow-Core Microstructured Optical Waveguides: 2-in-1 multispectral refractometry and raman spectroscopy

Supervisor: Professor Dmitry Gorin
Co-supervisor: Associate Professor Alexey Yashchenok

Name of the Reviewer: Nikolay A. Gippius

I confirm the absence of any conflict of interest	**Date: 19-11-2023**

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 is a good thesis that is devoted to explore hollow-core microstructured optical waveguide (HC-MOW) opportunities for multifaceted characterization of complex fluids. The thesis has a clear structure. It is composed by 8 chapters: the introduction, chapter devoted to literature review, 5 chapters for methods and results, and concluding chapter. The thesis is well illustrated. The

The topic of dissertation work is relevant to its actual content. The work is based on appropriate experimental methods and theoretical models.

I would like to mention following points to be addressed:

1. Detailed descriptions of the methods used in the experiments should be provided in Chapter 3. Currently, some of these descriptions are provided with the results in Chapters 4-7, and some others are missing.

2. The author should be careful when using abbreviations: all abbreviations should be introduced in the list of abbreviations and then explained in the text when they appear for the first time.

3. In Chapter 6, in the section on Raman spectra of BSA-P(VP-AA) structures, can any conclusions be drawn about the configurations of the intermolecular bonds? Perhaps the known molar ratios can be considered?

4. Explain the differences between the two types of gold nanoparticles used for SERS. Do they differ only in size or not?

5. How do the sizes of the nanostructures used for SERS correspond to optimal size?

6. More detailed explanations of the enhancement factors calculated in the thesis should be provided.

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*