

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Anastasiia Merdalimova

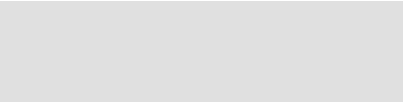
PhD Program: Physics

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: Dr. Dana Cialla-May

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| I confirm the absence of any conflict of interest  | Date: 17-11-2023 |
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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

Ms. Anastasiia Merdalimova presented her research work very well structured. She first introduced the required literature overview, including the principles, fabrication and application of the applied optical waveguides. Further on, she summarized the role of extracellular vesicles as biomarker in clinical detection. The research methodology is well structured and understandable. Finally, Ms. Merdalimova presents her research results including RI sensing and Raman/SERS spectroscopy by applying the applied hollow-core optical waveguides. She illustrated the potential of the, by her developed, detection scheme in the framework of the analysis of extracellular vesicles. Ms. Merdalimova submitted a PhD thesis of very good quality. The relevance of the here described highly innovative optical detection schemes, which can be applied to unsolved medical questions as well as with high potential to be applied out-side of specialized labs, i.e. at the point of care, is very high. Ms. Merdalimova worked on a highly innovative and highly relevant research topic, which future applications are promising within clinical settings. She applied throughout her research work innovative methods, such as RI sensing with

optical waveguides for sensitive detection, (enhanced) vibrational spectroscopy for molecular fingerprinting accompanied by high sensitivity as well as their application towards a potential clinically relevant detection of extracellular vesicles in cancer patients. By reflecting the current state-of-the-art, no optical detection scheme is available for a point-of-care detection of extracellular vesicles in patients, which underlines the high relevance of the research topic and results described in the present PhD thesis. Future research tasks might include the parallel detection of the extracellular vesicles by both RI sensing and (enhanced) Raman spectroscopy, which is not fully described yet. Ms. Merdalimova published her research results in peer-reviewed journals with very good to excellent impact factors, respected to the research field. Finally, I would like to mention some issues, which should be addressed during the thesis defense: (i) the SERS spectra of R6G, illustrated in Fig. 5-3 and 5-6 show differences in peak positions and/or peak ratio; (ii) how to distinguish between extracellular vesicles from different cancer types based on RI sensing and/or vibrational spectroscopy; (iii) what might be the reason that no significant Raman spectra of extracellular vesicles are recorded, as illustrated in Fig. 7-9.

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