Skoltech
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Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Daniil Ilatovskii

PhD Program: Materials Science and Engineering

Title of Thesis: Rational design of single-walled carbon nanotube films for transparent electronics

Supervisor: Professor Albert Nasibulin
Co-supervisor: Assistant Professor Dmitry Krasnikov

Name of the Reviewer:

I confirm the absence of any conflict of interest	**Date: 18-11-2023**

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

In his PhD thesis, Daniil Ilatovskii, entitled “Rational design of single-walled carbon nanotube films for transparent electronics”, describes the promotion of the optoelectronic performance of SWCNT films using of rational design at the deposition and post-deposition stages of the material fabrication. There are three main tasks including to develop a method for selective deposition of nanotube aerosol based on photophoretic phenomenon, a doping by means of deposition of material with high work function as coating layer and to evaluate the fundamental limits of SWCNT-based transparent conductive films by elaborating its ideal network with the highest optoelectronic performance.

This thesis is clearly written and well organized. It presents novel scientific results in the areas of Materials Science and Engineering. It was shown that the obtained results are of practical importance and can be applied in optoelectronics to improve the optical and electrical properties of transparent electrodes.

The text of PhD thesis is solid and is presented in a cohesive way. However, I have few comments to be addressed to the author for improve the quality of this PhD thesis:

1. PhD thesis contains three main aims, could you explain an interconnection between them?
2. Page 24, Figure 4, How we can obtain the positive and negative photophoresis in the frame of this work? Is it possible to realize it using only the wavelength variation?
3. I would like to know your opinion on the combined use of thermophoresis and photophoresis simultaneously for selective deposition? Do you expect a synergy effect in this case?
4. Page 44, Figure 4.3, Do you have explanation of changing of the fine structure of RBM peaks on Raman spectra with and without LED- irradiation? Could you explain the mechanism behind of the chiral selectivity of deposition through light irradiation (page 45, Figure 4.4.)?
5. Page 63, Figure 4.16 c, what do you expect the subsequent increase in the number of layers in the films for example 3, 4 etc.? Is it possible to obtain a percolation threshold by increasing the number of layers?

After correcting some minor points mentioned above, I recommend that Daniil Ilatovskii 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*