

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Artem Grebenko

PhD Program: Physics

Title of Thesis: Carbon nanomaterials: synthesis and charge transport

Supervisor: Professor Albert Nasibulin

Co-supervisor: Dr. Dmitry Krasnikov

Name of the Reviewer: Professor Dmitry Gorin

I confirm the absence of any conflict of interest

Date: 07-06-2022

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

Artem's dissertation is a high-quality research on the cutting-edge problems of modern material science. It is well-organized document concisely reported results and clearly presented outcomes. All goals set in the introduction section were achieved. The topic of dissertation work is directly related to its actual content.

The PhD thesis contains 6 Chapters. The introduction describes partly the state of the art related to the topic of the PhD study and formulates the main goal of the PhD thesis. The main goal of the PhD thesis has been obtained as results of the solution of following tasks: the synthesis, modification, and investigation of optoelectronic properties of low-dimensional carbon materials: single-walled carbon nanotubes and graphene. First chapter describes the motivation section, briefly introducing the materials. Chapter 2 presents a brief overview of the technological approaches and experimental techniques. One of the significant results described in Chapter 3, devoted to the CVD synthesis techniques, can be clearly claimed the most practically important as it reports novel methods for graphene synthesis, which is of a high interest in modern science and industry. On contrast, the next chapter, where results on charge transfer measurements are presented, is of a high fundamental importance thanks to the deep analysis of electronic properties of the synthesized materials. Finally, chapter 5 reports peculiar approach of Scanning Probe Lithography that can be used for curved and small surfaces. The last chapter briefly summarizes the results of Artem's PhD thesis.

Methods used in this research support its outcomes and relevant for obtained results.

All publications are published in high-impact journals, as results, Artem is co-author of 8 articles and 2 patents.

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

1. Page 20, Figure 4, please add the scale bar;
2. Page 23, Figure 5, please add the description of Figure 5 d, e, f in the figure's caption;
3. Page 24, Figure 6, please add the description of Figure6 a, b, c in the figure's caption;
4. Page 61, Figure 25, I didn't find any text related to Figure 25 B, C, D, E in the caption of Figure. Please add scale bar for Figure 25 F, G, H; There is no Figure 25 K, as well as L, please remove these symbols from Figure's caption;
5. Would be useful to apply backscattered electron scanning microscopy for characterization of carbon nanotube surface doped by AuCl₃

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