

Jury Member Report – Doctor of Philosophy thesis

Name of Candidate: Vsevolod Iakovlev

PhD Program: Physics

Title of Thesis: Advanced Synthesis of Single-Walled Carbon Nanotubes Films by Aerosol Method for Electro-Optical Application


Supervisors: Prof. Albert Nasibulin, Skoltech, Russia
Prof. Esko Kauppinen, Aalto, Finland

Chair of PhD defense Jury: Prof. Keith Stevenson, Skoltech

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Date of Thesis Defense: October 4, 2019

Name of the Reviewer:

<p>I confirm the absence of any conflict of interest</p> <p>(Alternatively, Reviewer can formulate a possible conflict)</p>	<p>Signature:</p>  <p>Date: 28-07-2019</p>
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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 the latest on August 13th. 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

Please write your statement / summary of issues to be addressed before the thesis defense here.

Despite significant progress over the last 25 years in carbon nanotube (CNT) production the methods of the single-walled CNT synthesis, data processing and CNT treatment developed so far are still not fully optimized.

Thus the research topic “Advanced Synthesis of Single-Walled Carbon Nanotubes Films by Aerosol Method for Electro-Optical Application” is relevant in the area of nanomaterial science.

The work is characterized by the use of modern scientific equipment sufficient to obtain reliable results on the study of the structural, electrical and optical properties of the studied materials based on single-walled carbon nanotubes.

The main part of the thesis (Chapters 4-7) consists the sections which represent the main results obtained in author’s publications.

The results obtained have a scientific significance and compliance with the international level and current state of the art. For example an advanced control on the diameter distribution, defectiveness, and the yield for the first time was achieved through the use of the artificial neural networks.

Thesis work includes three different electro-optical devices with advanced performance: i) a bolometer based on a freestanding SWCNT film; ii) a SWCNT-based heating element of fiber Bragg grid for smooth tuning of the resonant wavelength and a stable laser signal; iii) a saturable absorber based on SWCNT films showing femtosecond pulse generation and low degradation rate.

The bibliography includes 124 papers, which are mostly from the last decade.

The results are presented in 6 publications in journals with high impact factor. Some results (A comparative study of ferrocene and spark-discharge aerosol CVD reactors for single walled carbon nanotube growth: the role of ex situ nucleation) are presented in manuscript submitted to the Chemical Engineering Journal.

Vsevolod Iakovlev has made a very valuable and qualitative research carried out in the field of materials science.

However, the minor remarks are available: 1) lack of information in some references (9, 13, 14, 28, 41, 63, 64, 67, 74, 76 and 80); 2) using abbreviation SWNCT instead SWCNT (for example in Abstract).

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