

Jury Member Report – Doctor of Philosophy thesis / Pre-examination statement for Aalto University

Name of Candidate: Vsevolod Iakovlev

PhD Program: Physics

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


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

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

Email: K.Stevenson@skoltech.ru

Date of Thesis Defense: October 4, 2019

Name of the Reviewer: Georgy Fedorov

I confirm the absence of any conflict of interest	Signature:  Date: 07-08-2019
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The purpose of this report is to obtain an independent review from the members of PhD defense Jury / Pre-examiner before the thesis defense. The members of PhD defense Jury / pre-examiner 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

Please write your statement / summary of issues to be addressed before the thesis defense here. The guidelines were provided to you in the examination request:

It is well established for a long time that carbon nanotubes (CNTs) is a material with unique properties desired for many applications ranging from optoelectronic to mechanics to biosensors. These properties are defined and can be controlled by the composition and morphology, i.e. the distribution of geometrical parameters and atomic structure of the individual nanotubes forming the material. The thesis under consideration is mainly devoted to synthesis of high-quality CNT films with properties defined by the synthesis parameters. Applications of produced CNT films for optoelectronics is also demonstrated.

First result of the work is development of an advanced setup for aerosol CVD growth equipped with an arch-discharge generator of catalyst particles. Next the relation between the properties and composition of the synthesized films to various parameters of the growth procedure was thoroughly investigated. Given that there are many “degrees of freedom” one notes importance of employing the artificial neural networks (ANN) for establishing an advanced control over the properties of the synthesized material.

Furthermore, performance of the SWNT based films as a material for IR bolometers saturable absorbers, etc. was demonstrated. This makes the thesis of V. Yakovlev an important contribution to the studies of carbon nanotubes and opens paths for further work towards creation of efficient CNT based optoelectronic devices.

Scientific impact of thesis is confirmed by the level and amount of published papers, while the personal contribution of V. Yakovlev can be deduced to be significant due to thorough and clear explanations of the employed approaches, procedures as well as obtained results and their analysis.

Few minor remarks have to be made regarding the contents of the thesis:

Chapter 7.

7.1 What wavelength range is meant by IR? In what respect response of the bolometers to visible light would be different? Showing R(T) for the films used for bolometers would be helpful as well as comparison of the dark IV curves to those obtained under irradiation.

7.2 There are two figures labeled as “Figure 7.5”. The term “FWHM” should be added to the list of abbreviations.



Georgy Fedorov

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