

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

Name of Candidate: Pramod Mulbagal Rajanna

PhD Program: Physics

Title of Thesis: Hybrid heterojunction solar cells using single-walled carbon nanotubes and amorphous silicon thin films

Supervisors: Prof. Albert Nasibulin, Skoltech, Russia

Prof. Peter Lund, Aalto University, Finland

Chair of PhD defense Jury: Prof. Nikolay Gippius, Skoltech

Email: N.Gippius@skoltech.ru

Date of Thesis Defense: May 7, 2020

Name of the Reviewer: Prof. Anvar Zakhidov

I confirm the absence of any conflict of interest

(Alternatively, Reviewer can formulate a possible conflict)

Signature:



Date: 06-04-2020

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 April 21st. 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:

The doctoral thesis titled "Hybrid heterostructure solar cells based on single-walled carbon nanotubes and amorphous silicon thin films" by Pramod Mulbagal Rajanna is a solid work focused on the application of single-walled carbon nanotubes as p-type transparent conductors in amorphous silicon solar cells. The overall work is presented in a very systematic way answering all the research questions in a scientific detailed manner. The thesis is well organized, easy to read and understand and has a logical flow. From giving a brief introduction and background to the work, detailing the experimental methods used, to presenting the results obtained and discussing the scientific concepts, the candidate displays scientific understanding and maturity in detailing problems and finding its solutions in a consequential way, presenting relevant existing literatures wherever necessary.

The results obtained are of immense importance to the scientific community working on ITO-free transparent conductors, solar cells, and opto-electronic devices, in general. Additionally, the study on adhesion of single-walled carbon nanotubes using AFM is of fundamental importance, and has been rarely discussed before. The adhesion study is well presented and very complete. In general, I am confident that the results obtained are of high quality and certainly will impact scientific and technological communities in the area of solar photovoltaics and related technologies, with a possible future industrial applications.

A couple of minor comments:

The reference a-Si:H cells show much lower performance when compared to the best recorded cells. I suggest to discuss the reasons for this discrepancy in the thesis and during the defence.

However, it is suggested that the candidate highlights some of the possible future work, as the extension of this important study in the last section of his thesis.

In conclusion, the candidate has a good scientific achievement as witnessed by his discussion in the thesis and the publications in internationally peer reviewed research journals. Therefore, I strongly recommend the candidate to have a defence for PhD degree in the current form of the thesis.

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

