

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Mayuribala Mangrulkar

PhD Program: Materials Science and Engineering

Title of Thesis: Design and engineering of additives for improving the stability of hybrid perovskite solar cells

Supervisor: Professor Keith Stevenson

Name of the Reviewer: Aditya Sadhanala

I confirm the absence of any conflict of interest

(Alternatively, Reviewer can formulate a possible conflict)

Date: 20-09-2021

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

This thesis by Mayuribala Mangrulkar on “Design and engineering of additives for improving the stability of hybrid perovskite solar cells” is a well-structured, moderately detailed and self-consistent study. In this thesis - a potent idea has been explored - of exploiting additives as a tool to control/manipulate perovskite growth and photophysical properties, which in-turn affect the optoelectronic properties and their optoelectronic device performance including solar cells that have been explored here. The various dopants/additives explored herein in this thesis have been judiciously picked after due consideration. The results obtained have importance in developing the field of perovskite solar cells. Furthermore, these results would go a long way in helping achieve the scientific community in solving the stability problem in perovskite solar cells. These results have justifiably been published in impactful journals and have the potential to garner lot of scientific attention in coming time.

In summary this is a good piece of research work that does qualify as a doctoral thesis. There are many grammatical mistakes that need to be looked at and I suggest Mayuribala to have a keen read and correct these and at one odd place there is a figure missing as well. Furthermore, I have few minor but optional suggestions/comments:

- 1) Can you comment if these additives help alter the electronic property locally?
- 2) Do these additives dope the perovskite in some way and change their semiconducting nature in terms of being p-type, n-type or intrinsic?
- 3) I would have liked to see an expanded future work section for such promising work.

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