

## Jury Member Report – Doctor of Philosophy thesis.

**Name of Candidate:** Vahid Ramezankhani

**PhD Program:** Materials Science and Engineering

**Title of Thesis:** Design of potassium-ion batteries using novel organic electrode materials

**Supervisor:** Assistant Professor Stanislav Fedotov

**Name of the Reviewer:** Alexander KORSUNSKY

I confirm the absence of any conflict of interest  (Alternatively, Reviewer can formulate a possible conflict)	<b>AM Korsunsky</b>  <b>Date: DD-MM-YYYY</b>
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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 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

- Brief evaluation of the thesis quality and overall structure of the dissertation.

Thesis is devoted to the exploration of an important and interesting topic in battery research, namely, the use of organic electrode materials for potassium ion batteries. The headline problem is stated in the title and addressed in the manuscript in a way that is well grounded in the current state-of-the-art techniques for material characterization. The experimental approach appears to be solid so that the results are expected to be trustworthy.

The overall structure of the dissertation is somewhat idiosyncratic, in that all the results are assembled in Chapter 5, whilst the remaining chapters are devoted to accompanying materials pertaining to the introduction, background overview, objectives (1 page chapter!), methodology and concluding remarks (sic, rather than “conclusions”). In my opinion, this somewhat downplays the significance of the findings – particularly since this “engine room” chapter is entitled “Design of ...” – raising questions whether this thesis is about materials characterization and selection, or about design (which in itself is an extremely broad term). I would replace “design” in the chapter title with “characterization and optimization”, as it may be a better description.

- The relevance of the topic of dissertation work to its actual content

Interesting manner of posing the question: am I being asked if the title reflects the content?

I prefer to point out here that, in my opinion, the Objectives chapter needs re-thinking and revising.

For starters, it does not specify which materials are being studied – are these the only organic options possible? If not, then the objectives should be more specific.

In my practice, it is always helpful to think of any piece of work – be it a journal paper or a thesis – in terms of Highlights that should state the main achievements / elements of surprise or discovery, but not describe actions or measures. Turning this to the formulation of objectives, I would say those stated in the chapter fall short of what they should be, in my opinion, on the basis of me having read the finished thesis.

- The relevance of the methods used in the dissertation

It is abundantly clear that this is the case.

- The scientific significance of the results obtained and their compliance with the international level and current state of the art

The results appear to be competitive / lie at the current frontier of knowledge in the field.

- The relevance of the obtained results to applications (if applicable)

My impression is that the work presented in the thesis is a few steps removed from the application; rather, it represents an attempt to identify a promising direction for future search for polymer-based solution for a particular class of batteries. This is to be clarified in the interview.

- The quality of publications

These appear to be of good quality and presented in periodicals of good standing – this is one of the strengths of application for PhD degree.

- The summary of issues to be addressed before/during the thesis defense

During the defense I intend to seek to establish / confirm that the candidate as made a substantial, personal, and original contribution to the chosen field of learning. In fact, it is apparent from the volume of the thesis, the level of detail in the Appendix etc. that the former is unlikely to raise any doubt. However, it is noted that synthesis of all (or almost all?) polymer materials studied was performed by collaborators, so it is worth discussing the nature of the relationship with them, and the candidate's own contribution in terms of directing research. The aspects of originality also ought to be made clear both in the thesis and the presentation.

#### 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*