

## Jury Member Report – Doctor of Philosophy thesis.

**Name of Candidate:** Roman Kapaev

**PhD Program:** Materials Science and Engineering

**Title of Thesis:** Transition metal coordination polymers derived from 1,2,4,5-benzenetetraamine as active materials for energy storage devices

**Supervisor:** Professor Keith Stevenson

### Name of the Reviewer:

I confirm the absence of any conflict of interest <b>I have no conflict of interest.</b> (Alternatively, Reviewer can formulate a possible conflict)	<b>Date: 27-10-2021</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.*

In this thesis, nickel- and copper-based coordination polymers derived from 1,2,4,5-benzenetetraamine were prepared. Both materials were thoroughly characterized with a wide range of physical techniques. Electrochemical investigations in solid-state were performed to understand their potential for Li-ion battery application. The thesis was well-written. The overall structure of the dissertation was clear and easy to follow.

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

All the contents are highly relevant to the topic. The thesis was separated to 5 chapters. The first and second chapters are good reviews of current literature on Li-ion batteries and organic/inorganic hybrid electrode materials. Chapter 3-5 describes the Ph.D. research. Part of study has been published in two peer-review papers.

*The relevance of the methods used in the dissertation*

Yes, Chapter 3 nicely summarized all the methods used in this study

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

Yes. Organic/MOF-based electrode material is a challenging area due to the low stability of the compounds compared to inorganic LIB materials. By using 2D MOF structure, the stability of the electrode described here is significantly improved. Unfortunately, the voltage/redox potential of the materials is still too low for application, but this is a common issue for all organic electrode materials. I was particularly intrigued by the operando spectroscopic and XRD study. Most research in this field does not do in-depth analysis with operando techniques. The study reported here should be impactful in this aspect.

*The quality of publications*

Yes. Some of the work described here has been published in excellent journals, e.g., Chem Commun, Chem Materials.

**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*