

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Patrick Aggrey

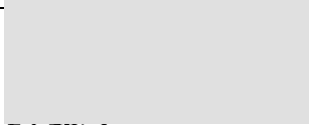
PhD Program: Materials Science and Engineering

Title of Thesis: Nanoscale phase separation and transformations in the silicon-oxygen and related systems

Supervisor: Professor Alexander Korsunsky

Co-supervisor: Alexey Salimon, Senior Research Engineer

Name of the Reviewer:

<p>I confirm the absence of any conflict of interest</p> <p>(Alternatively, Reviewer can formulate a possible conflict)</p>	 Date: 27-05-2023
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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

The thesis, authored by Mr Patrick Aggrey investigates routes for the processing of diatom earths for the production of silicate compounds that have the potential to be used In applications such as energy harvesting and energy storage. I found the topic of this research fascinating in the context of its relevance to environmental and sustainability concerns. The thesis describes how various pre-treatment approaches impacts the quality of the silicate precursors and demonstrates how this changes affect the performance of battery electrodes based on the Si compounds that have been harvested. Furthermore, this work investigates the production and performance of a-C antireflecting coatings on nanostructured DE-harvested Si that can potentially enhance the performance of solar energy harvesters.

This is a coherently composed manuscript that provides the essence of the research effort. The research methodology and analytical approaches that has been used throughout are appropriate and the conclusions are supported by the experimental results. It is my opinion that this work is technologically relevant and important, while the novelty is demonstrated by the rich published material in scientific journals and conferences.

The candidate has provided convincing evidence that this approach for harvesting Si compounds from naturally occurring DEs provides certain advantages in applications that are relevant to energy harvesting (solar cells) as well as improvement in the performance of Li ion battery electrodes.

The thesis is comprehensive and well written, apart from very few typos, however, there are areas which could be improved. Here are some suggestions:

- There should be a section where the advancement of the state of the art should be made clear. Although there are elements in the thesis where the advancement of knowledge is indicated, it is my opinion that there should be a clear statement of purpose regarding the particular areas where this work makes a clear contribution.
- A second point is related to continuity of this work in the form of an outlook section, which is currently missing.
- Finally, due to the extremely applied nature of this work and its relevance to production, I believe that any statements regarding the cost efficiency should be substantiated by some elementary cost analysis in comparison with mainstream analogues.
- There are very few minor typos and omissions, like missing scale bars in figure 34 and terminology inconsistencies such as EDX vs EDS. A careful review of the manuscript should be performed for the final version.

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