Skoltech
Skolkovo Institute of Science and Technology

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Milad Jafarypouria

PhD Program: Mathematics and Mechanics

Title of Thesis: Numerical simulations of stress-strain state in fibrous unidirectional polymer composites based on 3D geometry with variable microstructure at different stages of curing and post-curing

Supervisor: Dr. Sergey Abaimov, Skoltech
Co-supervisor: Professor Stepan Lomov, KU Leuven

Name of the Reviewer: Liaojun Yao

I confirm the absence of any conflict of interest (Alternatively, Reviewer can formulate a possible conflict)	**Date: 03-10-2024**

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.

This thesis provides an interesting investigation on the effects of fibre misalignment, fibre diameter distribution and fibre/matrix interface debonding on the stress redistribution around the broken fibre via FE numerical methods. This is an important and fundamental issue for composite material development and failure analysis. The findings and conclusions are solid and reliable, which can enrich people's in-depth understanding in this field, and are meaningful for composite material development and failure analysis.

The contents of this thesis are well organized and written, demonstrating this PhD student has done insight studies in this specific field, and has explored something interesting and important for the scientific community.

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

The contents are close related to the topic of this thesis.

- The relevance of the methods used in the dissertation

This PhD student proposed an FE numerical model to explore the stress redistribution around the broken fibre in composite laminates.

With this numerical strategy, the influence of a series factors, such as fibre misalignment, fibre dimeter distribution and debonding, on stress distribution of broken fibre has been thoroughly investigated. The numerical results are appropriately discussed and interpreted by the author. All these results indicate that this proposed FE model is effective to characterize stress distribution around broken fibre. Thus, people can employ this method in future study on this issue.

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

The novelty of this thesis is good. The main conclusions made in this thesis are useful and meaningful for people to have insight understanding on stress distribution around the broken fibre in composite material.

According to this study, the stress redistribution around a broken fibre can be appropriately determined. And the effects of a series factors on the stress distribution are thoroughly investigated and discussed. This study therefore can enrich people understanding on this fundamental issue, which is useful for future study on the failure of composite materials, as well as for composite material development.

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

No comment on this aspect.

- The quality of publications

The quality of the publications is good. All the relevant publications are published on the well-known journals with high IF that related to composite materials and technology.

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

Detail information related to the principle (or key points) of the methods proposed/used in this thesis work, and the important conclusions and findings obtained in this study should be clearly discussed and highlighted in the ABSTRACT, which are important for people to have better understanding on the importance of this thesis 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*