

DISSERTATION REVIEW

<i><u>Název posuzované práce:</u></i>	Prestressed Fibre Reinforced Composites: Manufacturing and Mechanical Characterization
<i><u>Doktorand:</u></i>	Raphael OGUNLEY
<i><u>Školitel:</u></i>	doc. Ing. Soňa RUSNÁKOVÁ, Ph.D.
<i><u>Recenzent:</u></i>	prof. Dr. Ing. Libor BENEŠ, IWE <i>Czech Technical University in Prague Faculty of Mechanical Engineering, Department of Materials Engineering</i>

In the introduction to my review, I would like to state that the dissertation of Mr. Raphael Ogunley, submitted to conclude his doctoral studies in the degree program "Process Engineering" specializing in (degree course) "Tools and Processes" (P0788D270013), at the Faculty of Technology, Tomas Bata University in Zlín, focuses on the fibre-reinforced polymer composites (FRPs). It also includes the fibre prestressing, which is the application of a controlled load to the fibre before or throughout the curing cycle of the composite. From a methodological perspective, this topic is closely linked to the research program of the training department and the professional profile of the supervisor.

The main contributions of this work include the acquisition and expansion of a knowledge base concerning a relatively wide range of the mechanical and manufacturing characterization of these studied, or developmental, fibre-reinforced polymer composites (FRPs). The findings presented here regarding the fibre prestressing are particularly current and valuable.

I would also like to acknowledge that the author has published most of the work in the scientific and professional journals, with the majority of the contributions and publications registered in the WoS/Scopus database (8 times), as well as in a conference paper. At the same time, many of the findings presented here can also be suitably used as a study material for undergraduate and master's students, as a manual for designers in the design of composite structures, or for doctoral students as a basis for their further creative work.

The use of these results in the applied sphere (in technical practice) is undoubtedly important, as evidenced by a number of solved projects that attest to the rich creative activity of the doctoral student. From an engineering and application perspective, i.e., considering the possibilities for further use of the presented outputs in technical practice, these are very interesting and undoubtedly promising materials and technologies suitable for a wide range of applications (or innovations), especially in transport technology. For these reasons, the chosen dissertation topic can be considered very current, which significantly increases the aforementioned application potential of the obtained results.

From a content and formal perspective, I also evaluate the work as very well and carefully elaborated, conceptually balanced, clear, and consistent, in terms of its overall arrangement, systematic organization, and chosen structure with logical connections. The author draws on the instrumental, laboratory, and personnel background available at the training department.

It is also necessary to mention a thorough review of the current state of knowledge in the field, documented by a list of a total of 176 cited works from professional literature, which is further supported by the author's publication activity, documented by the already mentioned 9 outputs (*indexed in the WoS/Scopus database*), as well as a number of solved projects that directly relate to the subject matter.

Based on a comparison of the "assignment" and the specific sub-tasks of the dissertation, as detailed in the specifications on page 49 (*"Aim and Objectives"*), with the content of the work itself (*especially the "Conclusion and Recommendation" on pages 104-105*), I can confirm that the doctoral candidate has fully met the set requirements and thus fulfilled the given objectives.

I have to especially commend the extensive experimental apparatus, which begins with the design (*constitution*) of the advanced composite structures, continues with their static and cyclic testing (*Tensile Analysis, Flexural Analysis, Charpy Impact Analysis*), and concludes with an interesting DMA Analysis and Electrical Conductivity Analysis, including the manufacturing verification and the optimization of the production technology itself.

Finally, in the light of the previous positive evaluations mentioned above, I can state here that the evaluated doctoral dissertation is beneficial due to its focus and the contribution of new (*theoretical, as well as practical*) knowledge, especially from the field of materials and technological (*manufacturing*) characteristics.

For the defense of this dissertation, I expect a reaction to the questions and points for consideration that I have compiled into the following list:

1. *How does the fibre prestressing affect the tensile strength and modulus of unidirectional and cross-ply CFRP laminates? Are the results comparable with another research papers/projects?*
2. *In what ways does elastic fibre prestressing influence the thermomechanical behaviour of CFRP laminates, particularly storage modulus and glass transition temperature (T_g)?*
3. *How do the fracture surface morphologies and dominant failure modes differ between prestressed and non-prestressed CFRP laminates?*
4. *How did you monitor the applied prestress level during curing process?*
5. *How could the improved electrical conductivity of prestressed laminates support multifunctional smart structures with sensing and defrozing capabilities?*

Conclusion:

The reviewed dissertation meets the required professional standards and brings the original findings leading to a number of practical applications. Through his own work, the doctoral candidate has demonstrated technical expertise and the ability to work independently and creatively.

Therefore, I can conclude that the submitted dissertation fulfills the conditions as stipulated in §47 of the Higher Education Act No. 111/1998 Coll.

I therefore recommend the reviewed work for defense. In the case of a successful defense, I recommend that Mr. Raphael Ogunley be awarded the academic degree of Ph.D.