

August 28, 2025, Prague

Reviewer's report on doctoral thesis  
**"Prestressed Fibre Reinforced Composites: Manufacturing and Mechanical Characterisation"**  
by Raphael Ogunleye

**a) Achieving the set goals of the dissertation thesis**

Presented dissertation focuses on manufacturing and mechanical characterization of prestressed FRP composites. Five main objectives were set for the work: CAD design of custom prestressing jig, design and manufacturing of elastic fiber prestressed CFRP composite laminates, experimental program and corresponding damage analysis, as well as failure mode assessment of the prestressed and non-prestressed CFRP composite laminate, thermal evaluation of the prestressed and non-prestressed CFRP composite laminate and electrical conductivity analysis of the prestressed and non-prestressed CFRP composite laminate. To achieve the goals of the work, it was necessary to perform and evaluate several number of experiments. All goals of the submitted dissertation were fulfilled.

**b) Level of analysis of the current state of art**

Current state of art is described in Chapter 1 on 40 pages. It describes manufacturing technologies and possible processing challenges (voids, waviness and residual stresses) with focus on residual stresses problem, measurement techniques (destructive/non-destructive), their limitations and possibilities how to avoid residual stresses. The use of prestressed fibers is one of them and this possibility is further developed by the author. A sufficient number of references, including those from recent times, are used in the analysis of the current state of art.

**c) Theoretical and practical contribution of the dissertation thesis**

Presented dissertation systematically investigated the effect of 0 to 25 MPa prestressing levels on CFRP prepreg laminates with unidirectional and cross-ply configurations for tensile, flexural, Charpy impact, DMA and electrical conductivity testing with clear, statistically supported results. Failed specimens from mechanical tests were subjected to damage analysis with detailed description of failure modes. From the results the optimal value of prestressing can be determined which is useful for practice. Influence of prestressing on transversal characteristics is described also.

**d) Suitability of the applied methods and their application**

The selected methods follow current trends, and it can be stated that they were used appropriately.

**e) Formal level of the dissertation thesis**

The work is in order in terms of form and language and has a logical sequence. It is divided into

5 chapters, which correspond to the set goals. The author's publishing activity is very good (8 articles and 1 conference paper).

### **Reviewer's remarks**

- Use italics when writing about quantities and in equations (sometimes they are used, sometimes not).
- In table 1.2 or before it should be mentioned that aramid and carbon fibers are anisotropic so the elastic modulus in table 1.2 is in fiber direction.
- The author's results that have been published should be referenced in the text.

### **Reviewer's questions**

- Was there possibility to measure the fiber area with image processing methods on statistically representative sample to ensure that each sample has similar  $V_f$  (or  $A_f$  respectively - 283 mm<sup>2</sup>)?
- Test setup for tensile loading was with the use of extensometer. For 3PB tests there was evaluation just from the crosshead of the testing machine or any other method was used (videoextensometer, DIC...)?
- Does the author have an idea of how the conclusions and recommendations for flat samples are transferable to samples of more complex geometry to the or real parts with different lay-up than 0° or 0°/90° and combined loading?

### **Reviewer's statement**

The submitted thesis of Raphael Ogunleye represents a significant contribution to the field of design of composites with prestressed fibers. The author has demonstrated high professional knowledge in the field of experimental methods.

All goals of the submitted dissertation were fulfilled. The dissertation contains original and published results, demonstrates the ability and readiness for independent activity in the field of research or development and meets the conditions specified in § 47 Section 4 of the Act.

Based on the above facts, I recommend the thesis of doctoral student Raphael Ogunleye for defense.

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Assoc. Prof. Ing. Bc. Zdeněk Padovec, Ph.D.