

Review of the Doctoral Thesis

“Fiber reinforced polymer composites: preparation, mechanical properties and thermal analysis”

by Konstantinos Karvanis

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Reviewer: Petr Jonšta

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The submitted Doctoral Thesis is focus on study of mechanical and thermal properties of Fiber Reinforced Polymer (FRP) composites prepared by vacuum bag method or hand lay-up technique. The topic of the Thesis is actual and beneficial for practice. The wide use of FRP composites with higher performance parameters (excellent strength and stiffness to weight ratio, anticorrosion and thermal resistance) are significantly important for demanding applications especially in automotive and aerospace industry.

Dissertation Thesis is written on 135 pages, contains 85 figures, 15 tables and 63 references. The Thesis is divided into 6 main chapters, including an introduction and a conclusion, and includes a list of references, figures, tables, symbols and abbreviations, publications and professional curriculum vitae. The dissertant is the author or co-author of a total of 7 publications indexed in the SCOPUS database. Mr. Karvanis participated in 3 internal grants of TBU in Zlín.

The theoretical part of the Thesis contains a brief introduction to FRP composites, methods of their production, used experimental techniques for verification of composites properties and literary review. The objectives of the Thesis are clearly and comprehensibly stated and are on pages 21-22. The main goal of the Thesis was to explore mechanical and thermal properties of selected FRP composites produced by various techniques. Fibres, namely glass, carbon, aramid and basalt with different orientation and volume fraction were embedded in various epoxy matrices and used used for experiment. Tensile and 3pt. bending tests were used for determination of composites' mechanical properties. Storage and loss modulus and glass transition temperature determination by determined by dynamic mechanical analysis. Thermomechanical creep recovery and stress relaxation tests were also performed. Thermal stability of fibres was determined by termogravimetric analysis.

Based on the obtained results, it can be concluded that the aim of the Doctoral Thesis has been fulfilled.

The thesis is written in appropriate English with a number misprints or incorectness. For better orientation I would welcome a list of symbols and abbreviations used at the beginning of the Thesis. The tables are well integrated into text. Some figures in the work do not contain any important information a should have been removed (e.g. Figures 2.1, 2.2, 2.4, etc.). The figure of the testing samples lacks markers and also many figures are not sharp. The present experimental technique was used to fulfill the objectives of the work.

Mr. Karvanis demonstrated the ability to solve a given technical problem. The submitted work has expanded the knowledge about mechanical and thermal properties of selected FRP composites and results can be use in technical practice and also for further research activities in the field of material and mechanical engineering.

I have the following suggestions and comments for the discussion:

- 1. Can you describe more deeply the statement on the page 95 that the AFRP composites have higher Tg than the CFRP and ACFRP composites.*
- 2. On the paragraph 1.7. Contribution of the thesis to science and practice you mentioned the target to find the potential composite materials for applications in airspace industry. Can you specify the requirements from aerospace industry for materials generally?*
- 3. Why you didn't use another experimental procedure for investigation of mechanical properties of chosen composite materials?*
- 4. Can you specify the kind of fracture after three-point bending test and compare each other?*
- 5. Which internal defects are connected with selected manufacturing technology?*
- 6. How big was contents of voids and via which experimental procedure the contents of voids should be investigate?*

Doctoral Thesis of M.Sc. Konstantinos Karvanis meets all the requirements for this type of thesis. Therefore, I recommend it for defence and after successful defence I propose to award to M.Sc. Karvanis the degree

philosophiae doctor – Ph.D.

In Ostrava, August 23, 2021

