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Milad Bazli, Hamed Ashrafi, Armin Jafari, Xiao-Ling Zhao, Hamed Gholipour, Asghar Vatani Oskouei

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Effect of thickness and reinforcement configuration on flexural and impact behaviour of GFRP laminates after exposure to elevated temperatures

Milad Bazli [1,*]; Hamed Ashrafi [1]; Armin Jafari [2]; Xiao-Ling Zhao [1]; Hamed Gholipour [3,4]; Asghar Vatani Oskouei [4]

[1] Department of Civil Engineering, Monash University, Clayton, Victoria, Australia
[2] Department of Civil Engineering, Sharif University of Technology, Tehran, Iran
[3] Department of Mechanical Engineering, Shahid Rajaee Teacher Training University, Tehran, Iran
[4] Department of Mechanical Engineering, Amirkabir University of Technology, Tehran, Iran
[5] Department of Civil Engineering, Shahid Rajaee Teacher Training University, Tehran, Iran
[*] Corresponding author; Email: Milad.Bazli@monash.edu

Abstract

This study investigates the flexural and impact behaviour of GFRP laminates after exposure to elevated temperatures. The effect of fibre's length and orientation, laminate's and exposing time is studied. A total number of 540 tests in terms of three-point bending and Charpy impact tests were conducted to obtain the mechanical properties. In addition, SEM analyses were carried out to investigate the degradation mechanisms. Finally, statistical study was conducted to investigate the contribution of each variable and developing probabilistic models using ANOVA and linear Bayesian regression method. The results showed that generally the flexural and impact properties of GFRP laminates decreases by increasing the temperature and time of exposing as well as decreasing the laminates' thickness. It is also observed that laminates with unidirectional fibres have the best performance under elevated temperatures, while laminates with randomly distributed fibres are the most vulnerable type. The performance of laminates with woven fibres are almost between those two other types. However, all types of the laminates lost almost all their flexural strength and impact energy absorption capacity at 300 ˚C.

Key words

GFRP laminates; Elevated temperature; Bending; Charpy impact; Fibre orientation