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Bin Yu, Peigang He, Zhenyu Jiang, Jinglei Yang

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Interlaminar fracture properties of surface treated Ti-CFRP hybrid composites under long-term hygrothermal conditions

Bin Yu[1], Peigang He[2], Zhenyu Jiang[3]*, Jinglei Yang[4]*

[1]School of Mechanical and Aerospace Engineering, Nanyang Technological University, Singapore 639798

[2]Institute for Advanced Ceramics, Harbin Institute of Technology, Harbin 150080, China

[3]School of Civil Engineering and Transportation, South China University of Technology, Guangzhou 510640, China

[4]Department of Mechanical and Aerospace Engineering, Hong Kong University of Science and Technology, Hong Kong, China

*Corresponding authors. Tel.: +86 2087111030. Email: zhenyujiang@scut.edu.cn (Z. Jiang)

Tel.: +852 3496 2298, Email: maeyang@ust.hk (J. Yang)

Abstract

The interfaces between the composite and metal in fiber metal laminates (FMLs) are vulnerable to the attacks of moisture and heat. Two surface treatment methods are introduced to improve the interlaminar performance of the FML made of titanium alloy (Ti) and carbon fiber-reinforced polymer (CFRP). The FML prepared using the anodized Ti plate and CF sheets grafted with multiwalled carbon nanotubes shows significantly increased interlaminar fracture toughness (1382%), compared with the FML fabricated with sandblasted Ti plate and untreated CF sheets. The exposure to long-term hygrothermal environment, i.e. 60-day immersion in simulated seawater at room temperature, reduces the performance of both treated and untreated FMLs. However, the treated maintains the improvement of interlaminar performance, and shows much higher interlaminar fracture toughness (25.5 times) than the untreated. This study provides a feasible solution to tune the interlaminar properties of the FMLs based on titanium alloy and carbon fibers for industrial applications.

Keywords: A. Hybrid; B. Environmental degradation; B. Interface/interphase; B. Fracture