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

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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

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