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Reinforcement Effects of Aluminum-lithium Alloy on the Mechanical Properties of Novel Fiber Metal Laminate

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Abstract: The novel fiber metal laminates based on aluminum-lithium alloy (NFMLs) were investigated to improve the stiffness and damage tolerance. The aluminum-lithium sheets were rolled from 2 mm to 0.3mm by cold forming, aged to T3 state and anodized in phosphoric acid. Then, NFMLs were prepared by the optimized process. The mechanical properties of NFMLs were evaluated by floating roller, interlaminar shear, tensile, bending and fatigue crack growth (FCG) tests respectively. The results indicated that the aluminum-lithium alloy was mainly strengthened by δ' phases at T3 state. The rough micro morphology was constructed on the surface of aluminum-lithium layer by anodizing process. NFMLs and conventional Glare presented similar density and quite excellent interlaminar properties. Compared with Glare, however, NFMLs exhibited slight strength increase and obvious elastic modulus improvement regardless of the fibers plies and sampling direction. A better resistance to FCG of NFMLs was also verified.

Keywords: A. Hybrid; A. Laminates; B. Mechanical properties; B. Fatigue

1 Introduction

Fiber Metal Laminates (FMLs) combine the outstanding fatigue resistance and high strength of fiber reinforced composites with the ductility of metal alloys [1, 2]. As the second generation of FMLs, Glare is manufactured by alternating layers of 2024 aluminum alloy and glass fiber reinforced epoxy [3, 4], which possesses excellent fatigue and impact resistance, good residual and blunt notch strength, convenient manufacture and repair. Nowadays, Glare has been widely

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