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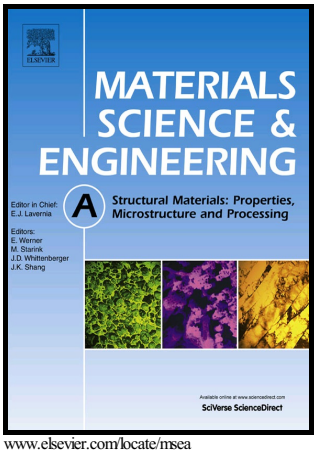
Li Longbiao



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Modeling strength degradation of fiber-reinforced ceramic-matrix composites under cyclic loading at room and elevated temperatures

Li Longbiao*

College of Civil Aviation, Nanjing University of Aeronautics and Astronautics, No.29 Yudao St., Nanjing 210016, PR China

*Corresponding author; Tel.:+86 25 84895963. Email:llb451@nuaa.edu.cn;

Abstract

In this paper, the strength degradation of fiber-reinforced ceramic-matrix composites (CMCs) under cyclic loading at room and elevated temperatures has been investigated. The shear-lag model combined with the matrix statistical multiple cracking model, interface debonding criterion and fiber fracture model has been adopted to analyze the stress distributions in damaged CMCs, considering the damage mechanism of the interface wear. The relationships between the residual strength and peak stress, interface debonding, fiber failure and cycle number have been established. The effects of fatigue peak stress, initial and steady-state interface shear stress, fiber Weibull modulus and fiber strength on the degradation of residual strength and fibers failure have been investigated. The evolution of residual strength versus cycle number curves of fiber-reinforced CMCs under cyclic loading at room and elevated temperatures have been predicted.

Keywords Ceramic-matrix composites (CMCs); Airworthiness; Strength; Matrix cracking; Interface debonding; Fibers failure.

1 Introduction

Ceramic-matrix composites (CMCs) possess high strength-to-weight ratio at high