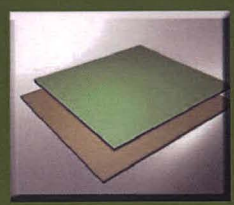
ADVANCES IN COMPOSITE MATERIALS



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Chapter 033

Numerical and Experimental Investigation of Peel Strength of Composite Sandwich Structures

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Keywords: Composite sandwich structure; peel strength; strain energy release rate; finite element analysis.

Abstract: Due to high stiffness and strength to weight ratios, composite sandwich is used increasingly in aerospace applications. The main drawback of sandwich structure is it's prone to peel off at their interface leading to failure. In this chapter peel test has been used to characterize the interfacial bond strength between composite strip and its core. A finite element analysis was performed to model the peel test. Fracture mechanics, using strain energy release rate has been applied to the modelling of peel growth in composite sandwich. In this approach, the critical strain energy release rate is the parameter that controls the growth. Results from the analyses are compared to experimental data and are found to compare well. The outcome is the ability to evaluate peel strength for various sandwich structures.

Introduction

Composites are an exciting class of materials used in high-performance structural, aerospace and electrical applications. Structural composites combine the properties of low density, high strength, high modulus of elasticity, good fracture and fatigue resistance [1]. The properties of composites also depend on the interfacial strength, determines how efficiently the stress is transferred to the fibres. Interfacial strength is usually derived from both mechanical and chemical bonding [2]. Bonded joints may be subjected to tension, compression, shear, or peel stresses, or any combination of the above. They are strong in shear, compression and tension but perform poorly under peel and cleavage loading [3]. The adhesion phenomenon can be characterized mechanically by using peel test. The peel test method is widely used for measuring the adhesion of joints and laminates in which one or both substrates are thin and flexible.