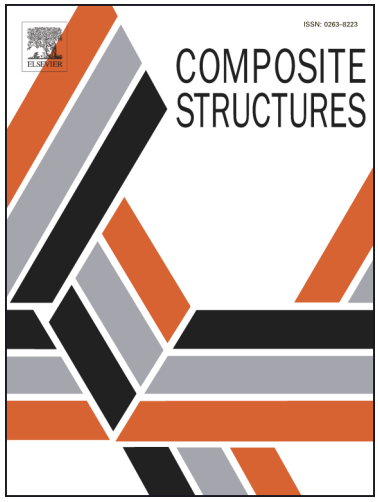

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A COMPOSITE SANDWICH PLATE WITH A NOVEL CORE DESIGN

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ABSTRACT

In this study, a new core design is introduced for sandwich composite structures. Its strength and failure behavior are investigated via three-point bending tests. E-glass-fiber-reinforced epoxy resin is selected as the material for both the core and the face sheets. The core has an egg-crate shape. Acoustic emission (AE) method is used to detect the progression of damage. Signals due to elastic waves caused by activated damage mechanisms are investigated in order to identify the corresponding failure modes. A finite element model of the sandwich structure is developed to predict the failure behavior of the specimens under the loading conditions in the tests. A promising agreement between the results of the finite element model and the experiments is observed. The force-deflection- relation, the failure load as well as the region where damage initiates are accurately predicted.

Keywords: Sandwich panels; Composite materials; Acoustic emission; Out-of-plane loading; Three-point bending; Finite element modeling

1. INTRODUCTION

For engineering applications, achieving an effective structural design is one of the major goals of the design stage. Load-carrying structures are desired to be as light as possible and damage tolerant with high stiffness and strength properties. In some cases, the desired properties may be achieved by using monolithic composites while for some other applications, combining two different types of materials into one discrete structure like hybrid and sandwich composites leads to improved properties in terms of cost and weight. Sandwich structures are usually preferred for weight-critical applications requiring high flexural stiffness and strength. Face sheets are usually made of continuous fiber-reinforced composites or metals to impart high stiffness and strength, whereas core is a lightweight structure, which can be honeycomb, foam, corrugated plate, or truss structure. Separation of skins by placing a core in-between increases the moment of inertia, which increases

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