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A novel fabrication method and mechanical behavior of all-composite tetrahedral truss core sandwich panel

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ABSTRACT: A novel hot-press molding method was developed to manufacture all-composite sandwich panel with tetrahedral truss cores in this paper. The out-of-plane compressive and in-plane shear behaviors of this structure were investigated by experiments. The results have shown that the tetrahedral truss core sandwich panel had a high compressive specific strength compared to metallic truss core sandwich panels. The node failure was observed in the experimental process. Finite element analysis (FEA) with a progressive failure model was involved to simulate the damage evolution process and predict the mechanical properties. The analytical formulae were also presented to predict the stiffness and strength of sandwich panel. Good agreement was found between FEA calculated results and the experimental results. It is expected that this study can provide useful information for the fabrication and application of all-composite tetrahedral truss core sandwich panel.

Keywords: A. Sandwich structures; B. Mechanical properties; C. Finite element analysis (FEA); D. Mechanical testing

1. Introduction

The fiber reinforced composite sandwich panels with truss cores can reduce the weight of structures used in aerospace and marine vessels effectively. The “open-celled” architecture of truss cores can help immensely in integrated designs of multifunction systems compared to common enclosed sandwich panels, such as wiring installation, embedding energy absorbing materials or fireproof materials, liquid storage [1-3]. Over the past decade, the manufacture technologies, mechanical

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