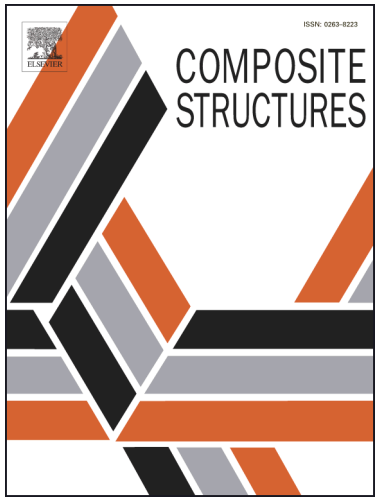

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A numerical study on the impact behaviour of natural fibres made honeycomb cores.

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ABSTRACT

Natural fibres have been adopted for long time as low-cost fillers in the plastic industry but, nowadays they are starting to replace glass fibres in composite structures thanks to their advantages in terms of weight, cost, and environmental (biodegradability) characteristics. Among the others, one of the most interesting application of natural fibre composites is related to the manufacturing of honeycomb cores for sandwich panels with an improvement in terms of weight saving as well as in mechanical properties and functional capabilities, such as vibration control, heat and energy dissipation. In this work, a numerical model, able to predict the impact behaviour of natural fibres honeycomb cores, has been proposed. An explicit impact analysis has been conducted and the results have been validated by comparisons with experimental data in terms of impact force as a function of impactor displacement. Furthermore, the numerical deformed shapes have been compared with experimental images taken during the impact test. The results have demonstrated the validity and the robustness of the proposed numerical model.

Keywords: Sandwich Panel; Honeycomb cores; Impact; Natural Fibres; Finite Element Analysis (FEA).

1. Introduction

Fibre reinforced composite materials have achieved in the last years a great relevance in aerospace, automotive and marine industries leading to a gradual replacement of metallic alloys in engineering structures thanks to their increased strength, resistance to fatigue, weight reduction, improved stability, high stiffness and damage tolerance capabilities, especially when used to manufacture sandwich panels [1]. Sandwich panels are multi-layered structures characterized by high strength, bonding stiffness and a low-density core material. One of the main advantages of these structures is their capability to bear both the out-of-plane and in-plane loads and to undergo high flexural and

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