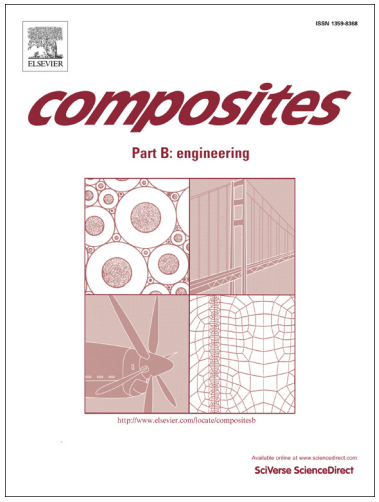

Impact characteristics of a composite energy absorbing bearing structure for railway vehicles

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Impact characteristics of a composite energy absorbing bearing structure for railway vehicles

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Abstract: To satisfy the requirements for passive safety protection during railway vehicle collisions, a front-end energy absorbing structure for a certain railway vehicle was designed with its collision performance evaluated based on integral analysis of the characteristics of a thin-walled metal structure and an aluminium honeycomb structure. A finite element model of the energy absorbing structure was established in ANSYS/LS-DYNA, and structures using three types of aluminium honeycomb (Honeycombs 1, 2, and 3, respectively) were assessed by numerical analysis. The results indicated that the entire structure generated orderly and stage-by-stage deformation according to the process by which energy dissipation had been designed. The larger the plateau stress acting on the honeycomb, the greater the contribution made by the honeycomb to the overall energy dissipation of the structure. The total energy dissipation was also improved with increased honeycomb structure plateau stress.

Keywords: A. Honeycomb; B. Impact behaviour; C. Numerical analysis; D. Mechanical testing

1. Introduction

The running safety of railway vehicles has attracted significant public attention: in recent years, research aiding the design of safer vehicle bodies has been one of the major topics of interest in the area of the structural design of railway vehicles in many countries [1-4]. The initial kinetic energy in the railway vehicle collisions should be absorbed or dissipated completely due to passive safety protection therein. Therefore, vehicle structures are required to show certain collision resistances, such as endowing the energy absorbing structure at the ends of a vehicle with certain properties [5,6]. Generally, the energy absorbing structure in a railway vehicle includes energy absorbing bearing structures and special energy

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