

Comparison of Homogeneous and Micro-Mechanical Modelling Approach for Paper Honeycomb Materials

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Abstract : Paper honeycombs, which is a sandwich structure, consists of two liner faces and one paper honeycomb core. These materials are widely used in the packaging industry due to their low cost, low weight, good energy absorption capabilities and easy recycling properties. However, to provide maximum protection to the products in cases such as the drop of the packaged products, the mechanical behavior of these materials should be well known at the packaging design stage. In this study, the necessary input parameters for the modeling study were obtained by performing compression tests in the through-thickness and in-plane directions of paper-based honeycomb sandwich structures. With the obtained parameters, homogeneous and micro-mechanical numerical models were developed in the Ls-Dyna environment. The material card used for the homogeneous model is MAT_MODIFIED_HONEYCOMB, and the material card used for the micromechanical model is MAT_PIECEWISE_LINEAR_PLASTICITY. As a result, the effectiveness of homogeneous and micromechanical modeling approaches for paper-based honeycomb sandwich structure was investigated using force-displacement curves. Densification points and peak points on these curves will be compared.

Keywords : environmental packaging, mechanical characterization, Ls-Dyna, sandwich structure

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