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Energy Absorption Characteristics of sandwich structures with composite sheets and bio coconut core

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Abstract

Composite materials has recently been widely used in the automotive, aerospace and other fields due to its light weight and good performance. At the same time, biological materials are also being paid more attentions in industrial application fields because of its economic, environmental, renewable and other advantages. Coconut mesocarp was chosen to be the core of composite sandwich structures with sheets of glass fiber reinforced plastics and carbon fiber reinforced composite were studied. Energy absorption behaviors were analyzed and compared. The thickness of all composite sheets is 1mm and the thickness of coconut mesocarp core is 20mm. Static compression tests were made by using universal testing machine. Results show that the composite sandwich structure with glass fiber reinforced plastic sheets and coconut mesocarp core has 1.0 J/g of per weight energy absorption, which is higher than 0.91 J/g of the composite sandwich structures with carbon fiber reinforced composite sheets and coconut mesocarp core. However, the peak crushing force of the former is less than the latter. Therefore, composite sandwich structures with glass fiber reinforced plastic sheets were selected for three points bending tests to study mechanical bending properties. By contrast with metal sheets sandwich structure and aluminum sheets sandwich structure, specific energy absorption of glass fiber reinforced plastic sheets sandwich structure is 2 times as much as metal sheets sandwich structure and 3-7 times as much as aluminum sheets sandwich structure, which shows an excellent crashworthiness performance of sandwich structures with composite sheets and bio coconut core.

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