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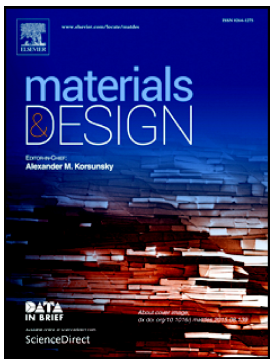

Increasing the structural energy dissipation of laminated fibre composite materials by delamination control

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Increasing the structural energy dissipation of laminated fibre composite materials by delamination control

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Abstract

In this paper an approach to increase the energy absorption capacity of laminated composites is investigated. The interlaminar interfaces of two different composite materials, a 2/2 twill weave of glass fibre reinforced polypropylene and a plain weave of carbon reinforced epoxy, are modified. Perforated, non adhesive polytetrafluorethylene (PTFE-) foils were interleaved between the composite layers leading to different interlaminar contact area (ICA) set-ups. The energy absorption capacity, impact resistance as well as the damage and failure behaviour, especially delamination, are evaluated in Charpy drop weight experiments. Based on the resulting force-displacement-response, initiation and propagation energies as well as the ductility index are evaluated. High speed camera imaging is used to correlate failure phenomena to structural response. It can be shown, that the failure behaviour of textile reinforced composites is significantly influenced by the interface modification concept. As a result, the delamination initiation and propagation is enhanced with lower ICA leading to higher energy absorption capacity on the one hand and higher propagation-to-initiation-energy-ratio on the other hand. Consequently, the already high energy absorption capacity of composite materials can be further increased up to 65 % while the ductility index rises up to ten times.

Keywords: A. delamination, B. energy dissipation, C. textile reinforcement, D. composite, E. modified interface, F. drop weight impact

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