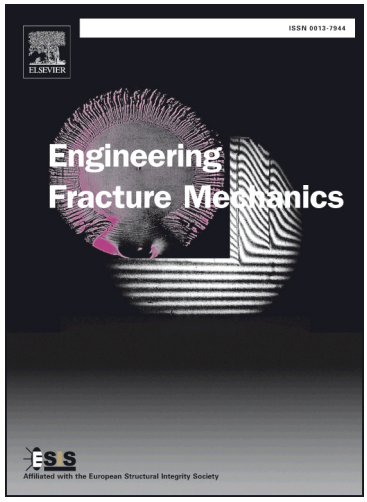

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Matrix Crack Interacting with a Delamination in an Impacted Sandwich Composite Beam

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Abstract

Delamination interacting with matrix cracking is a characteristic failure mechanism that is observed in the damage evolution of laminated composites subjected to low velocity impact. This failure mode can be studied in isolation by investigating the low velocity impact response of sandwich panels that have thin face sheets bonded to a core. In these panels, failure is seen to initiate in the core (akin to the matrix) by cracking, leading to delamination between the core and the face sheet. Experimental and modeling results for the flexural response and failure mechanisms of sandwich composite beams under three point bend loading, both for quasi-static and impact loading are presented. Digital image correlation (DIC) technique is used to obtain the surface strain field during the response event as well as capturing the onset of failure. A 2D, plane strain finite element (FE) model using the Smeared Crack Approach (SCA) has been developed to predict the response, and to capture the interactive failure seen in the experiments. The FE model accurately captures the response seen in the experiments as well as the mode of failure and the progression.

Keywords: Sandwich structure, Low velocity impact, Delamination, Matrix cracking, Damage evolution, Finite element analysis

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