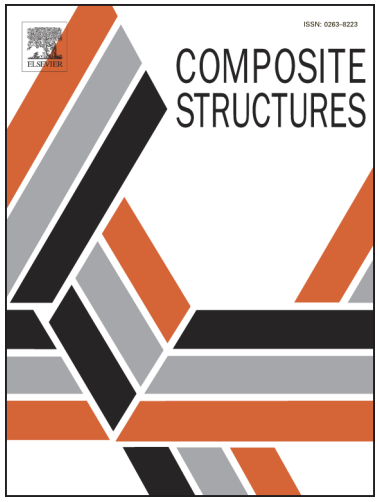

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New perspectives on impact damaging of thermoset- and thermoplastic-matrix composites from thermographic images

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Abstract

This work is concerned with the use of infrared thermography (IRT) to investigate impact damaging of composite materials, which involve both a thermoset matrix and a thermoplastic one, reinforced with either carbon, or glass fibres. Several specimens are impacted at different energy values while the surface opposite to impact is monitored with a high frame rate infrared camera. Impact tests are carried out with a modified Charpy pendulum which allows for positioning of the infrared camera. The impact energy is varied within a certain range, owing to the different types of specimen material and thickness, to have different damaging levels, but mostly barely visible damage. The obtained results show that monitoring the thermal signatures induced by impact supplies information useful for the material characterization, specifically for identifying initiation and propagation of the impact damage. In particular, from the time evolution of thermo-elastic effects it is possible to get information useful to establish the time interval the impactor remains in contact with the specimen surface and to derive information about bending and deformation of the surface under the impactor pushing force. In addition, the maximum rise of temperature coupled with the time evolution of heating events supplies information about the damage severity.

Keywords: composites, thermoplastic, impact tests, non-destructive evaluation, infrared thermography

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