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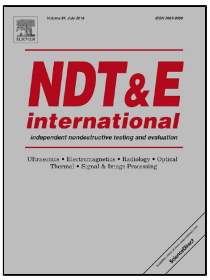

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Evaluation of Interlaminar Delaminations in Titanium-Graphite Fibre Metal Laminates by Infrared NDT techniques.

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Keywords

Layered materials, Fibre Metal Laminates, Debond, Infrared Thermography, Laser.

Abstract

Fibre Metal Laminates (FMLs) describe a number of aerospace-grade layered structural materials where thin metal alloy foils are interleaved with Fibre Reinforced Polymer (FRP) plies. Such material hybridisation at the layer meso-scale poses a challenge for non-destructive testing (NDT). On the other hand, the need for NDT inspection of FMLs arises due to the potential development of interlayers disbonds, both during fabrication or in-service. This work describes the successful implementation of two Infrared-NDT approaches to evaluate a defected FML panel made of Titanium/Graphite (Ti-Gr). One technique is based on the modulation of the deployed heat from a low-cost halogen lamp, to retrieve defects as phase-contrast signatures from harmonics in the frequency domain. The second technique uses a flying laser heat-source, raster scanning the surface, searching for defect signatures on the heat distribution trail of the moving laser. The work explores also the opportunity to collimate the laser heat source as a round spot or a linear distribution. The proposed non-conventional IR-NDT approaches are also compared with a well-established Pulsed Phase Thermography (PPT) algorithm, demonstrating a similar ability of defects evaluation, but offering some favourable features, which are highlighted in the work.