

ARTÍCULO PUBLICADO

Journal: Composites Part B-Engineering

Paper: Bonding sensor based on simplified Fiber Bragg Grating spectral evolution

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Abstracts: A new bonding sensor for composite material manufacturing based on a single uniform Fiber Bragg Grating (FBG) is proposed and demonstrated in this paper. The sensor design includes two edge sections attached to the bonded parts and a central free region, all made of an epoxy resin block of constant thickness, where the FBG is embedded. The quality of this bond is quantified by measuring the FBG spectral evolution. The strain transfer from the sensor to the embedded fiber allows to distinguish between two typical bonding defects in composite structures: asymmetric deformation and slide of bonded parts. Both cases have been experimentally checked and the results are in good agreement with simulations based on a simplified model using the Finite Elements Analysis (FEA) and Transfer Matrix methods, even under complex deformations