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ABSTRACT
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ADVANCING QUALITY CONTROL IN COMPOSITE MANUFACTURING: A STUDY ON FIBRE ORIENTATION DETECTION IN CFRP LAMINATES VIA INDUCTION THERMOGRAPHY

Carbon fibre reinforced plastics (CFRP) are advantageous for their high strength-to-weight ratios and customizable properties. These materials, are garnering increased interest for their potential in crafting lightweight yet robust components. Such attributes make them particularly appealing for applications in aerospace and automotive sectors. The thermography technique offers significant potential in the evolving field of non-destructive testing (NDT) of CFRP composite materials. Induction heating, as a thermal stimulation strategy for inspection of CFRP structures, elicits a heating response in a CFRP composite distinctly different from those in metals. The induction heating using a circular coil in CFRP laminates produces unique heating patterns, significantly influenced by the fibre orientations in each layer and electrical contacts between layers. This study investigates these patterns and proposes a novel method for identifying the fibre orientations. The method employs Radon Transform to extract fibre orientations from the spatial characteristics of the heating patterns. The study demonstrates the effectiveness of this method for accurately determining fibre orientations in quasi-isotropic CFRP laminates. This methodology opens potential applications for large-area inspection and quality control in fibre-reinforced composite manufacturing.