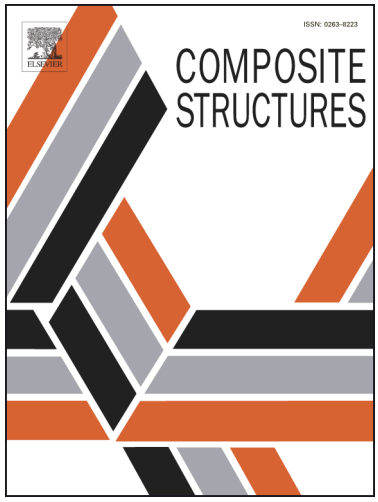

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Dynamic mechanical analysis and thermoelasticity for investigating composite structural elements made with additive manufacturing

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Abstract

Additive manufacturing (AM) has been widely used in recent years to build components and composite structural elements, since it allows complex shapes to be produced in one process step, quickly and with reduced weight. AM technology meets needs in many fields of production, including mechanics, industrial production, civil production, aeronautics, and medical implants. Nevertheless, during AM processes the material properties are affected by several setup parameters and the final mechanical characteristics are not completely defined yet. In this work, a measurement system is presented for defining the material mechanical characteristics of the printed components and composite structural elements. The parameters obtained are used for constructing a reliable finite element model to envisage the performance of the new structural elements before printing. The Dynamic Mechanical Analysis (DMA) for measuring the material mechanical properties and Thermoelasticity Strain Analysis (TSA) for validating the numerical model were used.

Keywords: Dynamic mechanical analysis; additive manufacturing; thermoelastic stress analysis; FEM analysis; thermographic camera.

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