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Embedded FBG Sensors in Additively Manufactured Polylactide Composites Reinforced with Continuous Fibers

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ABSTRACT

Additive Manufacturing is one of the most rapidly developing production technologies in the last decade. In case of polymeric materials the Fused Deposition Modelling (FDM) provides low cost and high versatility, however is limited by low accuracy and mechanical properties of applied polymeric materials. One of the ways of overcoming the latter deficiency is the modification of the FDM process allowing for the reinforcement of the printed composites with continuous fibres.

The objective of the research is to present the performance of additively manufactured Carbon Fibre Reinforced Polymer (CFRP) sample with embedded Fiber Bragg Grating sensors (FBG) under the influence of mechanical loading and temperature changes. FBG sensors were introduced to the middle of the specimen during manufacturing process. Experimental results show high nonlinearity due to a relatively low glass transition temperature of the PLA material. Additionally, the numerical modelling using the Finite Element Method provides more complex insight into the influence of embedded fibre optic on the AM composite material.

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