

Crack growth measurement and J-integral evaluation of additively manufactured polymer using digital image correlation and FE modeling

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Abstract

This paper presents and compares two combined experimental-numerical techniques for the investigation of fracture properties of additively manufactured polymer parts using digital image correlation (DIC) measurements. The first method uses only measured kinematic fields, and the second is based on Finite Element simulations driven by measured boundary conditions. A micro Single Edge Notched Tensile sample manufactured by fused filament fabrication of ABS is studied. It is shown that both methods locally extract J-integrals, and the crack tip is accurately located by the FE-based method. By comparing computed displacements to those measured via DIC it is possible to locally check the validity of the numerical model. The initiation and propagation stages are analyzed independently thanks to two different magnifications of acquired image series

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