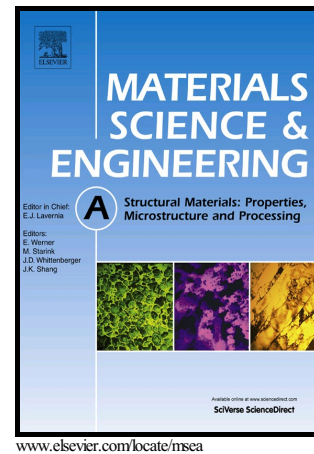


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Dwell-fatigue crack propagation in additive manufactured Hastelloy X

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Abstract

Additively manufactured Hastelloy X by laser-powderbed fusion is a superalloy used in for example burners and non-rotating parts in gas turbines. Turbines are often subjected to dwell-fatigue as a result of an operating profile including load cycles with long constant power output. The effect of building direction and heat treatments on dwell-fatigue crack propagation in additively manufactured Hastelloy X has not yet been thoroughly investigated. Crack propagation behaviour was characterized using compact tension samples cut from as-built and heat treated material blocks. Samples were machine with the notch parallel and perpendicular to the building direction enabling the investigation of building direction on crack behaviour and crack propagation rates. The samples were subjected to dwell-fatigue tests at 700°C with 90 s or 2160 s dwell-times at maximum load. Microstructural characterization was conducted using light optical microscopy and scanning electron microscopy techniques such as electron channelling contrast imaging and electron backscatter diffraction. The additively manufactured alloy exhibits anisotropic behaviour caused by the directionally solidified microstructure. Cracks propagated intergranularly and preferably

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