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Effect of Printing Parameters on the High Strain Rate Compressive Behaviour of Additively Manufactured 316L Stainless Steel alloy

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ABSTRACT

316L stainless steel alloy is widely used in hostile environments structural components due to attractive mechanical properties including good corrosion resistance and exceptional strength at high temperatures. The emergence of 3D-printing provides flexibility of 316L stainless steel alloy parts for various structural applications. A decent mix of metal powders, a combination of special printing parameters and printing orientation are however needed to improve the properties of the 3D-printed parts. Therefore, in the current studies, the effect of printing parameters and the build orientation on the microstructure and high strain rate properties of 3D-printed 316L stainless steel alloy was investigated. Printing parameters such as hatch spacing, laser power, scan speed as well as build direction have effect on the high strain rate compressive properties and microstructure of 316L stainless steel alloy. The microstructure will be characterized utilizing Optical Microscopy (OM) and Scanning Electron Microscopy (SEM) for final printed samples. Direct Impact Hopkinson Pressure Bar (DIHPB) will be used to examine the high strain rate deformation and failure modes. The microstructure of the samples was further characterized with Optical Microscopy (OM) and Scanning Electron Microscopy (SEM) post impact.

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