

An Investigation into Mechanical Properties of Laser Fabricated 308LSi Stainless Steel Walls by Wire Feedstock

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Abstract : Laser metal deposition by wire feedstock has been established as a process which can provide a high material deposition rate with good quality. Sound mechanical properties of the deposited parts are the pre-requisites for the real applications of this process. This paper investigates the laser metal deposition of 308LSi stainless steel wire within a process window. Single tracks and multiple layer thin-walls of 308LSi stainless steel wire were deposited on 304 stainless steel substrate. The grain structures of the built walls were examined using optical microscopy. The mechanical properties of the built walls including the micro-hardness and tensile properties along the transverse and longitudinal directions were investigated using Vickers hardness tester and tensile test machine. Long columnar grains were found growing in the wall building direction (transverse) and nucleation were observed at the boundary between two deposited layers due to remelting of the previously deposited layers. The results showed that the hardness values of the deposited walls (ranging between 194 HV and 167 HV) decreased from the track-substrate interface to the top of the wall. The ultimate tensile strength (UTS) of the wall (518 ± 7 MPa) showed dependence on wall building directions.

Keywords : laser metal deposition, ultimate tensile strength, hardness, wall, microstructure

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