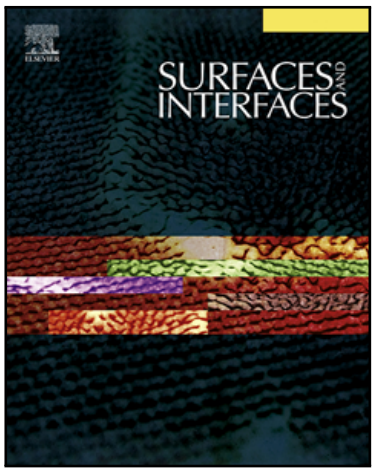

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Enhancement of surface characteristics of direct metal laser sintered stainless steel 316L by shot peening

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Abstract

The present work deals with the enhancement of the surface characteristics of stainless steel (SS) 316L fabricated through use of direct metal laser sintering (DMLS) process. Centrifugal type shot peening was performed using cast steel shots for improvement to the as-built surface quality. Shot peening leads to significant enhancement on the surface topography, which provided a trough profile with roughly spherical dents. The needle-like surface peaks which are generally observed on the as-built DMLS surface was also eliminated. In addition, the effect of shot peening was found to be more significant on the roughness parameters leading to 50% of reduction in the average surface roughness. The micro Vicker's hardness test led to the observation of an increase in the average surface hardness of the shot peened layer from VHN 230 to VHN 324. Microstructural examination after peening showed severe plastic deformation with laterally stretched grains on the surface. Further, X-ray diffraction analysis confirmed the presence of surface grains with high dislocation density. There was no phase transformation following shot peening i.e. conversion of austenite into strain induced martensite. The observations made from the current investigation would find new applications for SS 316L fabricated through use of DMLS process.