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Surface Characterization and Wear Behaviour of Laser Surface Melted AISI 316L Stainless Steel

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ABSTRACT: The present study concerns an in depth investigation of the influence of laser surface melting of AISI 316L stainless steel using Ar and N2 as shrouding atmosphere. Laser surface melting has been carried out using a 5 kW continuous wave (CW) fibre optics delivery Nd:YAG laser with a beam diameter of 4 mm. Microstructure of the surface melted layer consists of grain refined austenite when melted in Ar shroud and iron nitrides (Fe4N) and chromium nitrides (Cr2N) dispersed in γ-Fe matrix when melted in N2 shroud. Lattice strain and residual stress are also reduced by laser surface melting. The average microhardness of the melt zone increases from 240 VHN (for as-received AISI 316L stainless steel) to 375 VHN and 475 VHN for laser surface melted AISI 316L stainless steel in Ar and N2 atmosphere, respectively. Fretting wear behaviour against hardened steel ball shows a significant improvement in fretting wear resistance due to laser surface melting with a maximum improvement achieved in N2 shroud.