

Effect of in-situ heat treatment and process parameters on the laser-deposited IN718 microstructure and mechanical properties

Masina, BN, Skhosane, BS and Tlotleng, M

Abstract:

The direct laser-deposited Inconel 718 (IN718) specimens were produced using 1073 nm, high power continuous wave (CW), IPG Ytterbium fibre laser and in-situ heat treatment. The laser power and in-situ heat treatment temperature were fixed while varying the laser scanning speed from 0.83 to 2.50 cm/s. The microstructure and micro-hardness of the IN718 specimens were characterized using an optical microscope (OM), scanning electron microscopy (SEM) equipped with an energy-dispersive X-ray spectroscopy (EDS or EDX) and Vickers system. The microstructure of the specimens consists of γ -matrix as the primary phase, Nb-rich particles, constitutional liquation cave, liquation cracking and ductility-dip cracks. It was found that the micro-hardness profile of the IN718 specimens was gradually increased with the increase of the distance from the surface.