Influence of laser surface texturing (LST) parameters on the surface characteristics of Ti6al4v and the effects thereof on laser heating

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ABSTRACT

With rapid growth in laser-based manufacturing technologies, laser brazing has attracted significant attention in various industries such as automotive, biomedical and aerospace. Material heating in laser brazing is one of the factors to ensure maximum reaction between the filler and the base metal. During laser heating the energy needed to melt the filler is also dependent on the laser-material interaction, so in this work the effect of laser surface texturing (LST) parameters such as power, pulse frequency and scan speed on the surface morphology and roughness properties of Ti6Al4V were investigated using a fibre laser. It was found that an increase in laser power accompanied by a decrease in frequency and scan speed could increase the surface roughness. Additionally, the effect of surface roughness towards laser heating temperature was also studied with a fibre laser. When laser beam radiates a rougher surface the maximum temperature attained is 41.4% higher compared to a polished surface. This was mainly due to the laser energy scattering over a larger and rougher surface area causing amplification of the energy absorption in the form of temperature rise.

KEYWORDS

Fibre laser; Ti6Al4V; Laser surface texturing (LST); Laser heating; Pulse frequency; Surface roughness; Energy absorption

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