Production and optimization of 316L stainless steel dimples by laser surface texturing using Nd: YAG laser

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Surface patterning is of increasing interest in modern manufacturing processes to achieve better results in terms of wear resistance and friction of mechanical parts and tools and, consequently, to improve their lifetime in service conditions [1]. Several approaches have been used to modify the surface properties of steel components, namely deposition of coatings, sandblasting, and texturing by electron beam, electric arc, or laser ablation [1,2]. In this work, laser technology was explored to produce dimples on the surface of 316L stainless steel samples. The production of textures can have several purposes, namely in tribological applications where they can reduce wear by acting as a reservoir for the lubricant or be reinforced with other materials (e.g. ceramics or intermetallic compounds), capable of improving the surface properties [1–3]. This work presents a detailed study on the texturing of a 316L stainless steel (dimples - circle design) by an Nd: YAG laser and its surface characterization by Scanning Electron Microscopy and analysis software (Image J) for obtaining their width (diameter) and depth. The texturing parameters are discussed herein. Results show that the width of the dimples is little influenced by the scan speed and wobble, but strongly affected by the combination of laser power and number of passes. On the other hand, wobble strongly influenced the depth of the dimples.

References:

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