



LASER SURFACE MODIFICATION FOR ENHANCING MECHANICAL PROPERTIES OF METASTABLE STAINLESS STEEL 301LN

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ABSTRACT

The aim of this study was to select the optimum laser parameters for linear surface modification of a metastable austenitic stainless steel AISI 301LN. A combination of high surface hardness together with the minimum possible roughness was the objective, looking for increasing the mechanical properties of the steel, in particular the fatigue limit. In doing so, the effect of the laser parameters such as frequency (Hz), intensity (A), scanning speed (bits/ms), line orientations and line spacing (μm), was analyzed. The characterization of stainless steel treated by a nanosecond pulsed Nd: YLF laser beam was performed by evaluating surface hardness, roughness, and microstructural changes. The latter aspect is critical, because due to the metastable nature of 301LN, laser modification can induce the austenite to martensite transformation.

The optimum combination of laser parameters was obtained using high intensity (4 A) and high speed (5 bit/ms). In addition, it was observed that the approximation between the lines decreased the roughness of the samples. Other parameters, such as the frequency and orientation of the lines, have a minimum impact on the studied characteristics.

Keywords: laser modification, metastable steel, hardness, roughness, martensitic transformation.