Surface Properties of Continuous Laser Cleaning Affected Carbon Steel Substrate

Shusen Zhuang [1], Yuyang Liu [1], Lijie Zhu [1], Zhenan Li [2], Heyang Wang [1],

1 School of Advanced Manufacturing, Fuzhou University, No.1, Shuichen Road,

Jinjiang, China

2 Lonjing Environment Technology Co., Ltd, No.399, Linhou Road, Huli District,

Xiamen, China

Presenter's e-mail address: liuyuyang2589@163.com.

Abstract: This study investigates the application of high-power continuous wave laser irradiation as a novel surface treatment technique. Laser cleaning was applied to the carbon steel substrate, and surface characterization was conducted through scanning electron microscopy and X-ray diffraction to analyze surface morphology and oxide composition. The results revealed that laser treatment significantly altered the steel surface, with more pronounced effects after repeated scanning due to increased oxygen content and roughness. The laser-induced heat accumulation led to the formation of grain deformation and grain refinement layers, with repeated scans intensifying these changes. The study concludes that laser scanning time play a critical role in surface morphology, affecting roughness, oxygen content, and microstructure, thus providing valuable insights into optimizing laser cleaning parameters in steel structures.

Keywords: Laser cleaning; Steel substrate; Surface property; Repeated scanning

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