INVESTIGATING LASER SURFACE TEXTURING ON SS 304 FOR SELF-CLEANING APPLICATIONS

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ABSTRACT

Laser surface texturing can be deployed for generating super hydrophobic surface. On these surfaces, water droplets roll off by gravity easily picking the contaminations along its path when the surface is slightly titled yielding the cleaned surface. This paper presents laser surface texturing of SS304 surface in line with the self-cleaning characteristics. Comprehensive experiments were planned to optimize the processing parameters for generating super hydrophobic surface on SS304. The optimum texturing was generated with micro-grooves cross geometries pattern by the thermal ablation and melting using 100 ns, 20 W pulsed fiber laser beam with a width of ~180 μm and depth of about 8-10 μm and center-to-center distance of ~100μm. The textured surface was tested by depositing a layer of contamination of dust and carbon of about 100 μm thickness. It could be cleaned at 10^0 tilting angle with 98% cleaning efficiency using a water shower applied for only 5 seconds by self-cleaning process, while a non-textured surface with same contamination takes 120 Seconds with only 40% cleaning efficiency. Further, the experimental outcomes were analyzed and explained using an analytical model. The developed methodology paved a way for potential deployment of laser surface texturing for generating super hydrophobic surface for various domestic and engineeringapplications.