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An optical diagnostic technique for laser removal of graffiti

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In this paper, we propose an optical surface measurement based on laser scattering to monitor situ the laser cleaning threshold for the removal of graffiti. This technique is meant to assist the laser removal process using laser pulses of 10 ns at 1064 nm while probing the weak laser beam at 632 nm. The diagnostic apparatus consists of a HeNe laser performing a probing light source and photodiodes. A polarizing beamsplitting cube is used to split the probe beam into two separate beams which are called the reference beam and the sample beam. The reference beam is sent to the unaffected graffiti surface while the sample beam is incident on the affected graffiti surface. The spots of the two probe beams on the surfaces are imaged onto photodiodes. In this approach, the signals detected by photodiodes can be analyzed and indicated the laser cleaning threshold. A setup of angular laser cleaning allows the simplicity of this optical measurement. For this study, the use of a Q-switch Nd:YAG laser operating at 1 Hz was investigated. By mean of the Z-scan method, the laser fluence of the laser cleaning beam can be varied. The sample under investigation is irradiated by the Z-scan laser beam achieved by the scanning lens. The level of laser cleaning has been also determined through the optical setup. The laser removal of graffiti from mortars under dry and wet conditions was attempted to examine the cleaning procedures. The results obtained by this demonstration have proven to be a reliable technique for an online surface inspection for laser cleaning applications. Furthermore, this optical diagnostic technique can allow a variety of interesting applications for laser cleaning technology.

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