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The Characterization of Surface Texture in Laser Bamboo Engraving: A Metrological Approach

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Abstract-

Laser engraving is a widely used technique for bamboo applications. However, the literature lacks a recommended standard roughness parameter or a numerical comparison between samples for a quantitative assessment of surface texture post-engraving. In this research, we systematically evaluated well-known 2D roughness parameters typically used for metal parts and measured them for laser bamboo engraving under various laser conditions. We utilized a pulsed laser with a 450 nm wavelength and 5.5 W power to engrave bamboo specimens, examining the surface roughness at different speed and power combinations. We utilized all available parameters with calibrated equipment to compare the results and identify the most relevant ones for characterizing the final texture with sufficient resolution for bamboo specimens. Unlike existing studies, which were limited by testing materials and laser conditions, we propose only two 2D measurement parameters that can be evaluated and compared across different materials and engraving lasers, not just under specific conditions. These selected combinations of R and P parameters can determine the quality of the engraved surface with a single measurement. In this paper the Rz parameter is proposed as the quantitative parameter to characterize the engraving.

Index Terms- laser bamboo engraving; roughness set up; surface texture characterization

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