

## Supplementary Information

# Laser Inscription of Pseudorandom Structures for Microphotonic Diffuser Applications

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Optical diffuser fabricated with continues CO2 laser, differ from other texture sources <sup>[1, 2]</sup>, has provided more data on this supplementary.

*Table 1. The global parameters used in the COMSOL 5.2A to carry out the CO2 laser simulation with their respective values.*

Parameter	Value
Radius of the substrate	0.003 m
Height of the substrate	0.004 m
Total time of simulation	0.002 s

Ablation temperature	837.15 K
Density	2530 kg/m <sup>3</sup>
Specific heat	750 J/(kg·K)
Thermal conductivity	1.12 W/(m·K)
Power of beam	24 W
Laser beam spot	2E-4 m

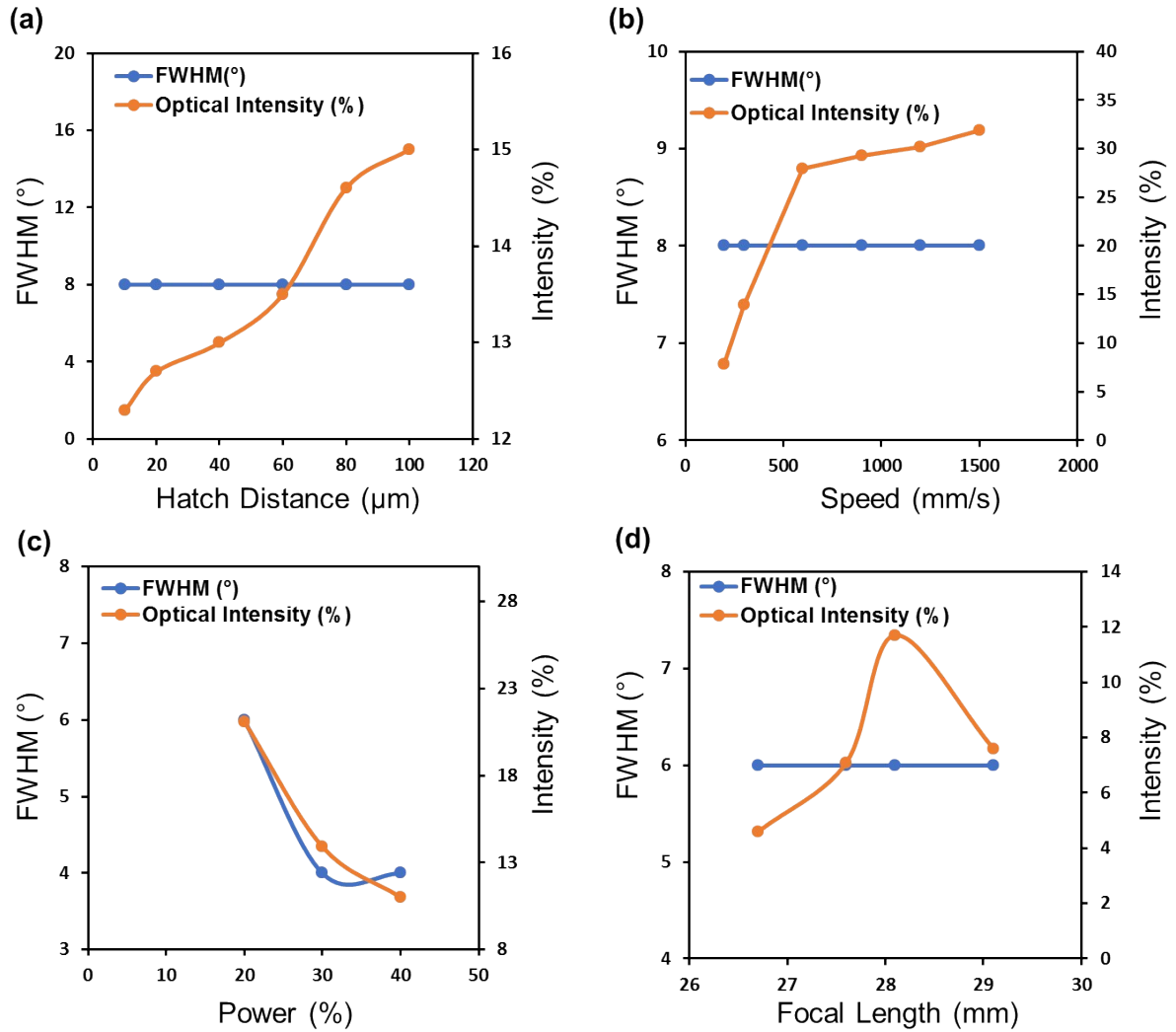


FIG. S1. Graphs showing the effect of changing the different laser parameters on the diffusion angle (FWHM) and the optical intensity of the transmitted light, one parameter was altered while fixing the other parameters for each experiment. (a) Hatch Distance ( $\mu\text{m}$ ). (b) Scanning speed (mm/s). (c) Laser power (% of 60 W). (d) Focal length (mm), the minimum laser spot diameter is provided at 28.1 mm.

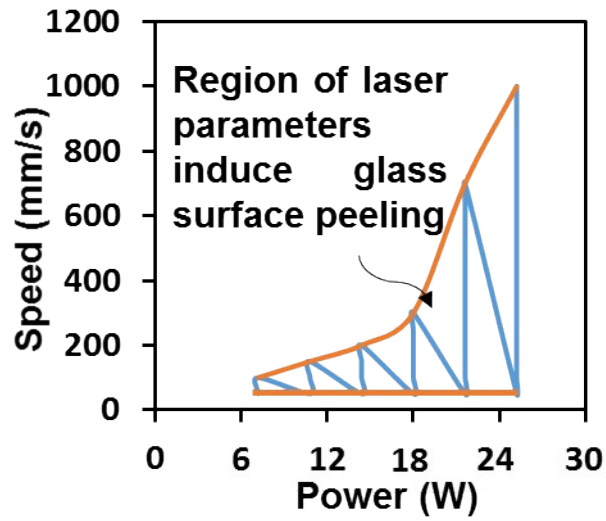


FIG. S2. A prediction model of CO2 laser induced glass surface peeling.

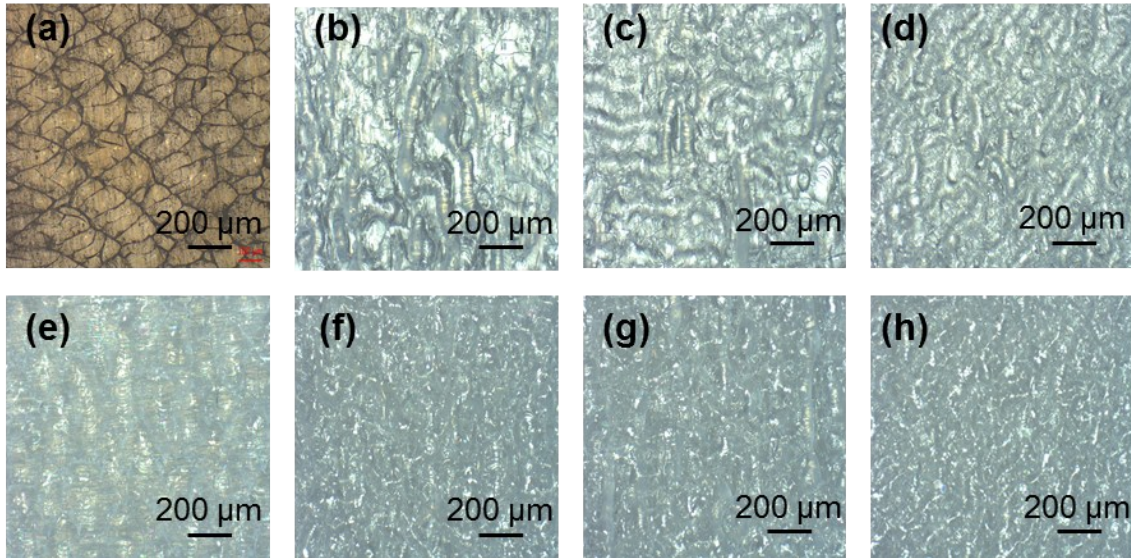


FIG. S3. Microscopic images (x5) of the fabricated diffusers using different surface relief structures, the specifications of the laser fabrication parameters and number of diffuser surfaces are detailed in Table 1. (a) Sample (S1), (b) Sample (S2), (c) Sample (S3), (d) Sample (S4), (e) Sample (S5), (f) Sample (S6), (g) Sample (S7), (h) Sample (S8).

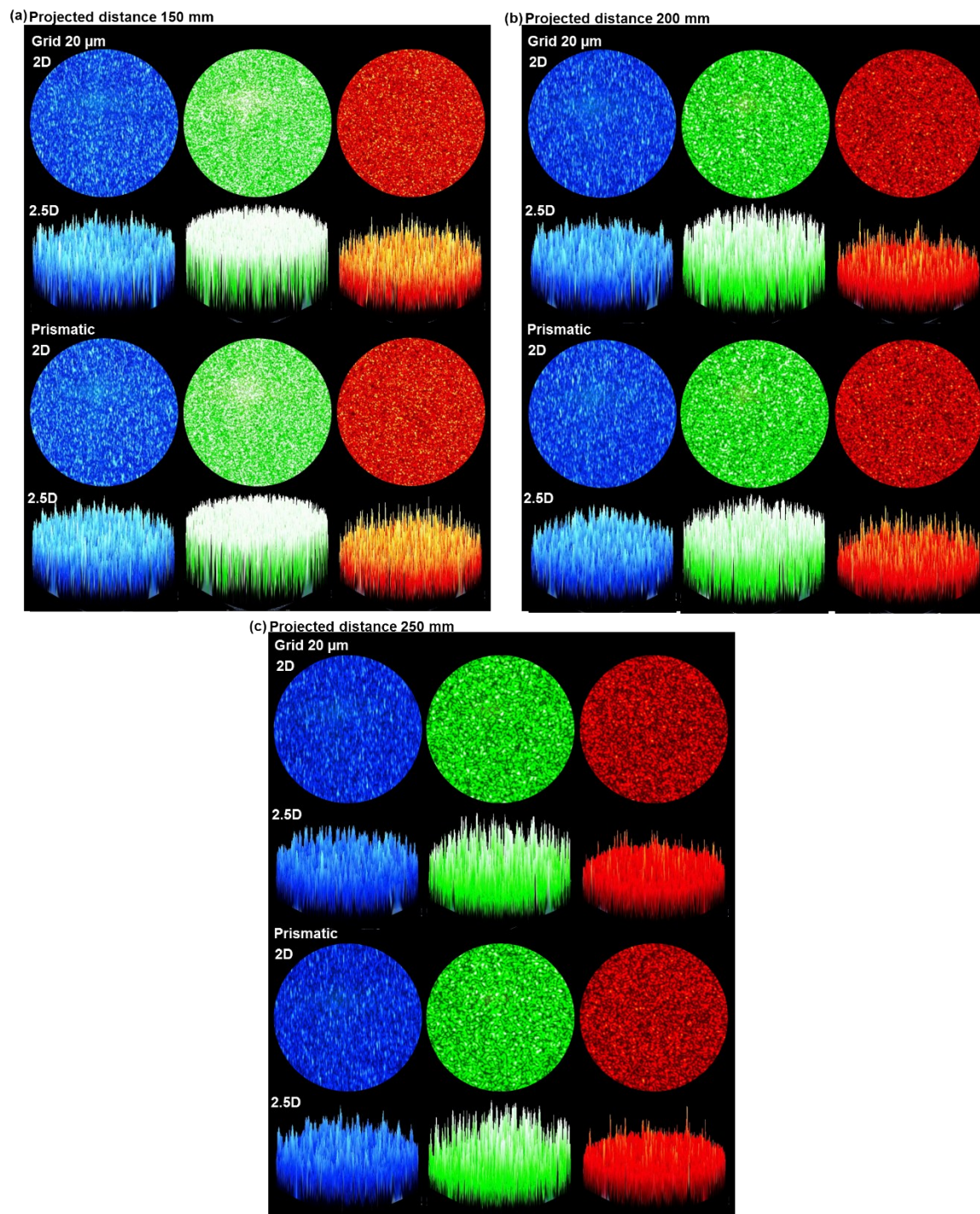


FIG. S4. The recorded image of speckle pattern at different projected distance (a) 150mm, (b) 200mm and (c) 250 mm for Grid 20  $\mu\text{m}$  and prismatic diffuser with varying laser wavelength (450, 533 and 633 nm)

1. Alqurashi, T., et al., *Nanosecond pulsed laser texturing of optical diffusers*. AIP Advances, 2017. **7**(2): p. 025313.
2. Alqurashi, T., et al., *Femtosecond laser directed fabrication of optical diffusers*. RSC Advances, 2017. **7**(29): p. 18019-18023.