Supporting Information

Dynamic water film assisted laser micromachining of micro-array structured surfaces for inducing hydrophobicity: Analysis model and experimental study

Jinda Yang [a], Zhongxu Lian [ab*], Haonan Jin [a], Jiaqi Wang [a*], Jinkai Xu [a], Yanling Tian [b]

[a] *Ministry of Education Key Laboratory for Cross-Scale Micro and Nano Manufacturing, College of Mechanical and Electrical Engineering, Changchun University of Science and Technology, Changchun 130022, China*

[b] *School of Engineering, University of Warwick, Coventry CV4 7AL, United Kingdom*

*Corresponding author.

E-mail address: lianzhongxu@cust.edu.cn; jqwang@cust.edu.cn

Fig. S1 illustrates the principle and method of measuring water film thickness using a laser displacement sensor. Due to the transparency of water, the laser beam not only reflects off the water surface but also penetrates the water film, generating multiple reflections at other interfaces, which leads to fluctuations in the measured signal (denoted as h_2). To address this issue, black dye was uniformly injected into the water film to render it opaque, ensuring that the laser beam reflects solely off the water surface and yields a stable distance reading, h_3. Assuming the distance from the sensor to the workpiece surface in the absence of the water film is h_1, the water film thickness at the corresponding location is calculated as $h_3 - h_1$. Using this method, the water film thickness in the DWFALM process was measured to be approximately 41.4 μm.

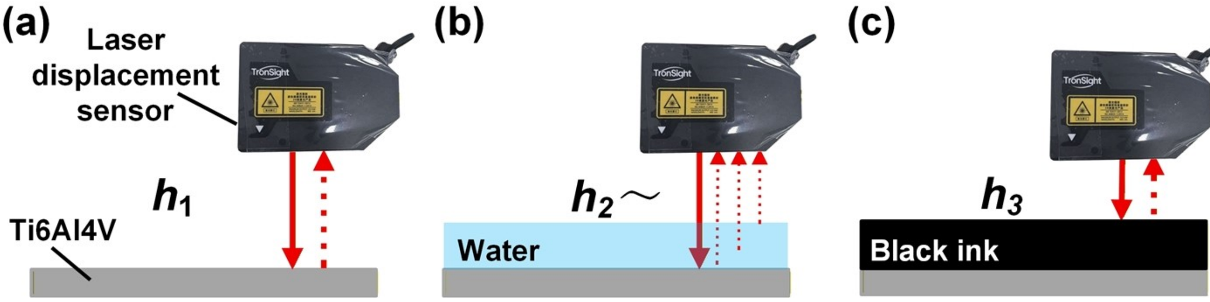

Fig. S1. Measurement method of moving water film.

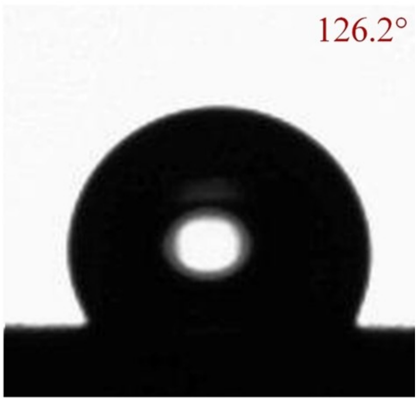

Fig. S2. Image of the contact angle on a smooth surface after fluorination treatment.

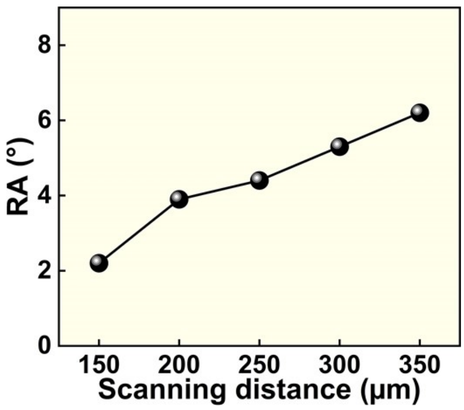

Fig. S3. Variation trend of RA with scanning spacing.