Impact of laser and external postprocesing parameters in the anti-wetting transition of nanosecond laser generated textures.

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Anti-wetting, or super-hydrophobic surfaces have been a subject of significant interest in the engineering field for many years, particularly due to the potential to create anti-bacterial and self-cleaning surfaces. A droplet of water landing on a super-hydrophobic surface will roll or slide away, whilst taking with it any surface debris. Such surfaces exist in nature, and there have been many reports where ultra-short pulsed lasers have been used to generate surfaces with similar feature sizes and hydrophobic performance. However it is also possible to produce super-hydrophobic surfaces with short (nanosecond) laser pulses. In this case the features generated are significantly larger and more complex, however the surface performance is remarkably similar. The use of such a laser, which is a lower cost and more mature technology than an ultra-short pulsed laser, provides the prospect of a more cost-effective solution.

In this presentation we report our work in which flat sheets of SS304S15 were textured using a nanosecond pulsed fibre laser operating at 1064nm, generating grooves of typical dimensions 10-30µm deep by 30µm wide, depending on the fluence. Quantitative analysis of the wettability of the laser structured surfaces was carried out by measuring the static contact angle of a droplet of deionized water with a volume in the microliter range. In line with other reports, these surfaces are initially hydrophilic, and after a time delay of some days to weeks transition into hydrophobic, and in some cases super-hydrophobic. In order to realise a practical process, our work has concentrated in speeding up this transition, and to this end we have studied the impact of low energy laser post-processing regimes as well as the effect of storage conditions.