Highlights

Light-matter interaction and non-equilibrium dynamics in advanced materials and devices - 2019

Laser surface texturing of copper and variation of the wetting response with the laser pulse fluence

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We report an experimental investigation on laser surface texturing of copper targets by Ti:Sa femtosecond laser pulses, addressing their wetting response to water droplets. In particular, fs laser surface processing is used to develop hierarchical surface structures by writing parallel micro-trenches with a period of 50µm at different laser pulse fluences. The laser irradiation simultaneously induces both the formation of laser induced periodic surface structures (LIPSS), in form of periodic ripples, and the random decoration with nanoparticles, resulting in the formation of a multiscale surface morphology. The morphological features of the samples are investigated and correlated with their wetting response, through static contact angle measurements. Our findings evidence a progressive increase of the contact angle with the laser pulse fluence. The combination of the microscale trenches, written by laser line scanning, with the ripples patterns and the random nanoparticles decoration, formed on the surface, allow developing highly hydrophobic copper samples with contact angles reaching values around 160°, presenting potential interest for wettability applications.

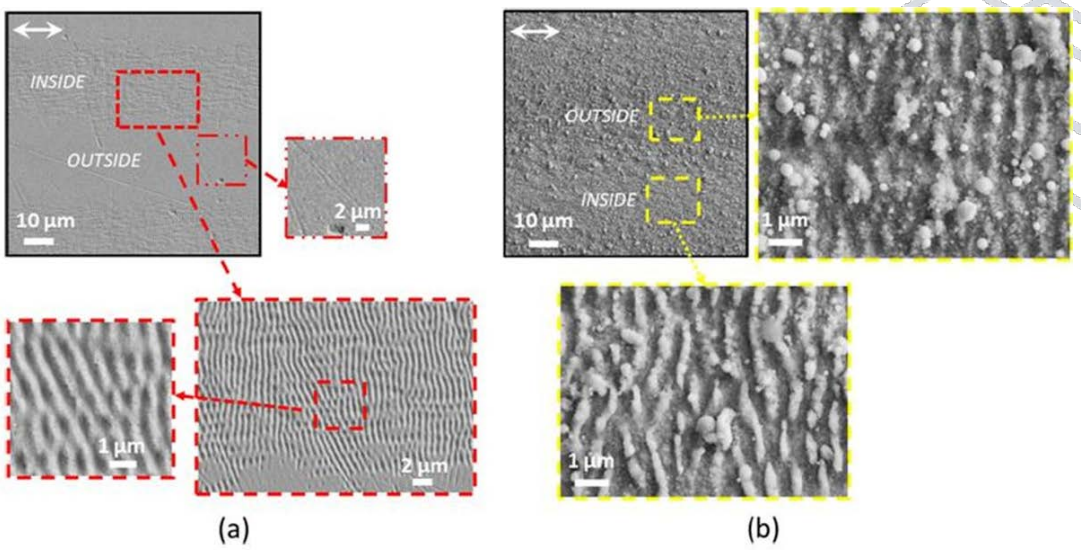

Fig. 1: SEM images of the sample surface addressing the morphological features for a peak fluence of: (a) Fp=0.8J/cm^2; (b) Fp=6.5J/cm^2. The SEM images within the dashed boxes are zoomed views of the selected areas. The double-headed arrow indicates the laser beam polarization.