

Laser micro/nano processing for photonics, optoelectronics, and smart surfaces

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The need for advanced materials and systems with new functionalities has motivated the development of micro/nanostructures on solid surfaces, which are necessary for the fabrication of functional devices for novel applications. In this talk, we will discuss the development of functional micro/nanostructures, based on laser-processed surfaces. Laser micro/nanofabrication presents distinct advantages, such as low cost, simplicity (tabletop apparatuses, maskless processes), large-scale potential, high spatial resolution (localized modifications, order of magnitude optical wavelengths).

Coating micro/nanostructures with thin metallic films results in plasmonic substrates with enhanced electromagnetic response across the entire visible range, which are used for plasmonic optical trapping [1,2] and surface-enhanced Raman spectroscopy (SERS) [3]. Combining silicon micro/nanostructures with thin semiconducting films results in electronic heterojunctions with increased surface area for improved optoelectronic performance [4,5]. “Smart” surfaces of controllable extreme wetting states are obtained by combining thermoresponsive polymers or photoresponsive metal oxides with micro/nanostructured substrates [6]. Also, surfaces with controlled topography, either at the micro- or at the nano-scale, for targeted cell cultures for biomedical applications [7].

References

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