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3D nanostructures for multifunctional plasmonics

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The development of new fabrication methods together with innovative device conception is one of the main reasons for the strong and fast growth of nanoplasmonics in the last decade. These two aspects are strongly related and they stimulate each other in conceiving creative and unprecedented functions. In the last years we introduced different 3D nanostructures and devices for managing the electromagnetic field at the nanoscale. In the first part of the talk we will revise our recent results concerning the combination of 3D plasmonic nanodevices, Raman Spectroscopy, and Superhydrophobic surfaces which enable the investigation of surfaces with nanoscale spatial resolution or liquid sample highly diluted (attomolar concentration). In the second part, we will present a novel fabrication approach able to realize 3D hollow plasmonic nanostructures that are tunable in size, shape, and layout. The fabrication process intrinsically promotes a straightforward integration of plasmonics with microfluidics, and electronics, whereas the 3D nature of the proposed architectures overcomes intrinsic difficulties related to the 2D methods, passing from the surface to a volume concept in a wide range of multidisciplinary applications. In particular, we will show our results about the combination of plasmonic antennas with CMOS arrays for the investigation of action potentials of neuronal networks.

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