Bottom-up approach to nano/microfabrication of photonic and plasmonic surfaces

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Bottom-up nanofabrication is an additive method in which the material elements are used to build up the desired objects. Frequently, bottom-up approaches are based on a self-assembly process. Although the range of symmetries or structures obtainable by self-assembly is somewhat limited in comparison with the top-down techniques, the promise of high throughput and low-cost processing over large areas implies that, at least in principle, methods that leverage self-assembly will have a central role in the development of advanced nanotechnology.
Processes like colloidal self-assembly and breath figure patterning can meet the challenge. Photonic structures prepared by these nanofabrication tools already proved their utility as antireflection coating and light outcoupling systems in optoelectronic devices. The possibility to precisely control the periodic structure at the nano- and microscale without expensive facilities is particularly advantageous for the development of sensors and biosensors that exploit the light-matter interaction to provide information on the surrounding environment. Possible outcomes of this approach are SERS-based sensors, where the plasmonic resonance induced by the nanostructures is exploited to amplify the Raman response. Moreover, the adaptation of the nanofabrication process to optical fibers would allow for the development of miniaturized sensing probes appealing for clinical purposes, as foreseen by the lab-on-fiber vision.
In this presentation I will show some of the possible photonic and plasmonic surfaces that can be obtained by this approach and provide some examples of application.

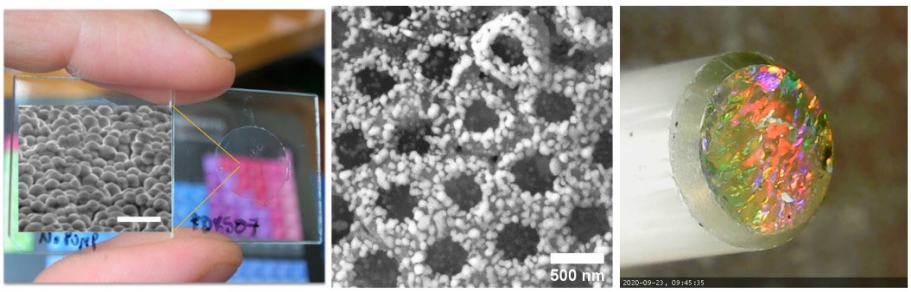

Figure 1. Bottom-up nanofabrication for different applications: antireflection coating (*left*), bio-inspired plasmonic surfaces (*middle*), optical fiber sensors (*right*)

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