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MS-1-P-1874 Plasmon Enhanced Fluorescence Imaging on Linear Arrays of Metal Half-Shells

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Recent studies on the fluorescence emission of fluorophores located nearby metallic nanostructures allowed the observation of peculiar phenomena such as modification of radiative transition rates, enhancement of emission quantum yield, or directional emission. The mentioned effects are induced by coupling between emitter dipole and surface plasmon polariton excitations. Controlling these interactions with ordered metal nanostructures bearing well-defined plasmon modes offers the means for advancing applications requiring e.g., an enhanced emission, improved photostability, or larger FRET distances.

Here we discuss our studies of Surface Enhanced Fluorescence (SEF) on metal-coated colloidal uni-axial arrays. These hybrid plasmonic-photonic crystals were obtained by colloidal convective self-assembly (CSA) on DVD templates and metal film evaporation [1]. Their morphology is resolved by electron microscopy and atomic force microscopy (see Figure 1),
while their polarization-sensitive optical response is evidenced by transmission and reflectivity micro-spectroscopy. SEF of fluorophores adsorbed on top of a spacing layer are studied by both steady-state and time-resolved fluorescence. Furthermore, fluorescence lifetime imaging (FLIM) is performed to highlight the correlations between topography / optical response / SEF. These results on fluorescence emission enhancement, plasmon-controlled emission
polarization, lifetime modification and imaging can be of interest both fundamentally, for better understanding of plasmon-coupled emission, but also from the application point of view, for the
design of sensors or other light-emitting devices.

[1] V. Saracut, M. Giloan, M. Gabor, S. Astilean, C. Farcau, ACS Appl. Mat. Interf. 2013, 5, 1362.

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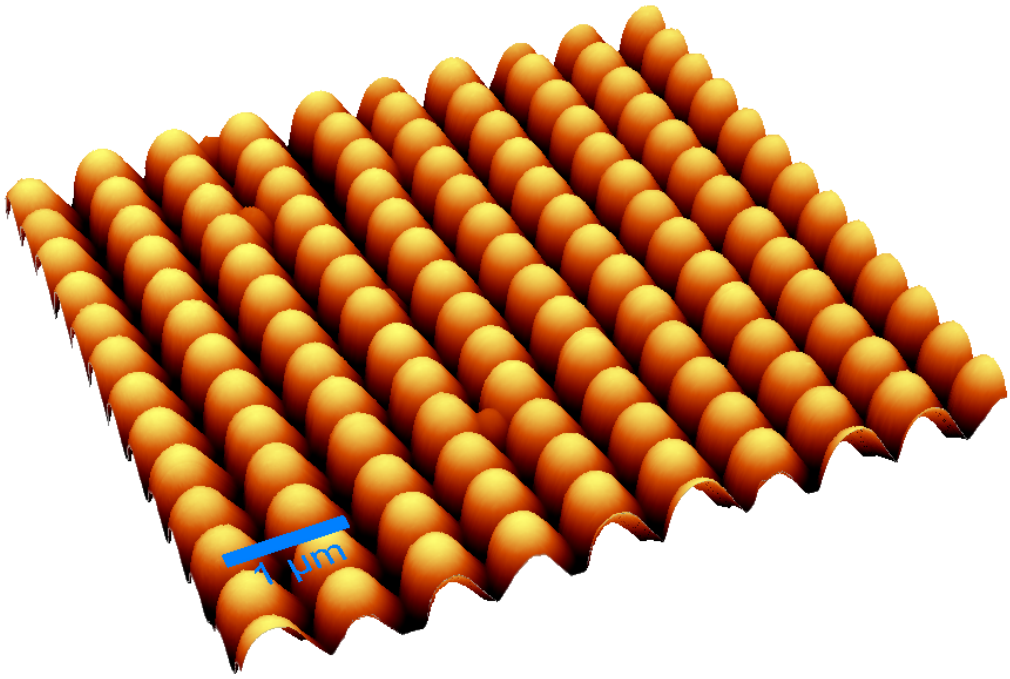

Fig. 1: AFM image of the hybrid plasmonic-photonic crystal consisting of gold half-shells onto polystyrene microsphere linear arrays.