Generating ‘Hot-Spots’ on Smooth Metallic Surfaces and their characterization by Second Harmonic generation and Cathodoluminescence

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Controlling the optical field down to the nanometer scale is a key step in optoelectronic applications and light–matter interaction at the nanoscale. Bowtie structures, rods, and sharp tapers are commonly used to realize such optical properties, but their fabrication is challenging. In this context, the complementary structures, namely, holes and cavities, are less explored. Herein, a simple system of two metallic nanocavities milled in thin silver film is used to confine the electromagnetic field to an area of ≈60 nm^2. The field is confined onto a flat surface area and is either enhanced or suppressed by the polarization state of incident light. The energy of this spatially confined mode is determined by the distance between the two cavities and thus any color (wavelength) at the optical regime can be achieved. As a consequence, a dynamically controlled color is generated on an optical pixel size smaller than 1 μm^2. We further characterize those surfaces by a set of complementary spectroscopic technique among them; linear optical imaging, cathodoluminescence and second harmonic generation (SHG).

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(2) Segal, E.; Weissman, A.; Gachet, D.; Salomon, A. Hybridization between Nanocavities for a Polarimetric Color Sorter at the Sub-Micron Scale. *Nanoscale* **2016**.