

- Call for proposals

Title and affiliations (must fit in this box)

Design of hybrid 1D nanostructures for sub-wavelength wave-guiding, emission and sensing

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Abstract (No longer than 250 words. Both the abstract and references must fit in this box. Style is Calibri 12, single line spacing)

One-dimensional nanostructures are promising systems for integration in devices in nano-optoelectronics and nanophotonics. Using simple and inexpensive shaping processes, it is possible to design complex nano-architectures by combining different materials to control light-matter interactions at a sub-wavelength scale, to obtain cavity effects or even laser emission, and to get multifunctional devices.

We designed and studied various hybrid nanostructures synthesized by template strategies using conjugated or nonconjugated polymers, gold, or nanometric phosphor composites. These systems enabled the demonstration of photonic or plasmonic propagation within nanowires and nanotubes, and the excitonic engineering of nano-sources. Here, we will report on three original systems.

In a first system, the spectral and spatial engineering of two kinds of luminophores within nanowires made possible to prevent charge and energy transfer between the two types of phosphors. It resulted in highly luminescent and easy color control nanosources with the opportunity to get a color shift from green to red at a sub-10 nm scale.

In a second system, light propagation characteristics along individual SU-8 resin nanotubes were modeled (FDTD) and determined experimentally. Active waveguides were obtained by incorporating different fluorophores.

Finally, recent developments will be presented, with the objective of realizing devices plasmonic-mediated remote nano-sensors. For this purpose, coaxial nanowires have been produced with a gold core to ensure the surface plasmon polariton propagation along several micrometers, and to amplify the emitted signal of the shell (Raman, fluorescence) at the opposite nanowire tip.