COLLOIDAL NANOPARTICLES: FROM BUILDING BLOCKS TO POSSIBLE APPLICATIONS

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In this paper, we are presenting some on the main results obtained in our Labs, regarding two different types of confined structures:

(i) solvent sensitive polymeric colloidal crystals (PCC) based on the growth of direct polymeric colloidal crystals and subsequent infiltration with elastomeric matrix. The composite film realized presents a green iridescent colour attributed to the colloidal crystal structure; moreover optical measurements performed on the (PCC) evidenced that the diffraction peak is red shifted respect to the initial position (about at 550 nm for PCC) when different solvents are applied to the surface of this structure; suggesting that PCC systems can be used as chemical sensors, thanks to: (1) high sensitivity for specific solvents, (2) fast response (less than 1s), and (3) reversibility of the signal change.

(ii) metallo-dielectric colloidal structures (MDCS) based on the realization of inverse silica opals and relative attachment of gold nanoparticles on the silica network of the inverse structure. Optical measurements show that MDCS have unique optical properties that combine the localized surface plasmon resonance properties of individual Au nanoparticles with the photonic band gap features of colloidal crystal structure. Preliminary results on MDCS used as SERS substrate evidence an increase of the Raman signal respect to other metallic structures used as comparison.

[1] A. Chiappini, et al., Opt Mat (2013) in press