

Chiral plasmonic systems: Assembling of achiral building blocks into 3D nanostructures

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Plasmonic nanostructures that exhibit chiral properties have become a subject of interest in recent years due to their applications in spectroscopy, catalysis and ultrasensitive detection of chiral molecules [1]. In the present work, we investigate the effect on the optical properties (lineal (LD) and circular dichroism (CD)) of individual achiral nanorods by adding non-chiral elements to the structures. Firstly, we show the evolution of the chiral properties by adding pillars according to their composition (Au and CaF_2) and their arrangement with respect to the rods (*Figures 1 and 2*). In addition we incorporate ferromagnetic materials in order to analyse the intertwined magneto-optical and chiral properties and control them by magnetic fields [2]. Finally, we explore the effect on the optical response of the structures by attaching a second rod. We analyse the role of the interactions in stacked gold dimers by modifying the dielectric separator and the relative angle between the rods [3]. Nanostructures were fabricated by Hole-mask colloidal lithography (HCL). This fabrication method allows growing nanostructures with a controlled chirality and handedness of the structure over cm^2 [4]. AFM and SEM images were used to characterize the morphology of the structures. Optical characterization was carried out by measuring Mueller Matrix elements to discriminate the chiral effect from the optical anisotropy, and magneto-optical Kerr measurements in polar configuration to analyse the magnetic contribution in their magneto-optical properties.

References

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Figures

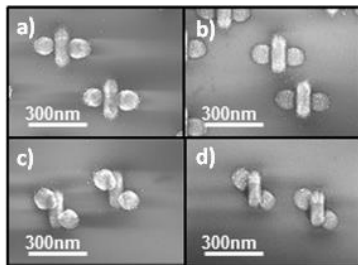


Figure 1: SEM images of individual nanorods with pillars at different configurations and composition (Au (a) and c) and CaF_2 (b) and d).

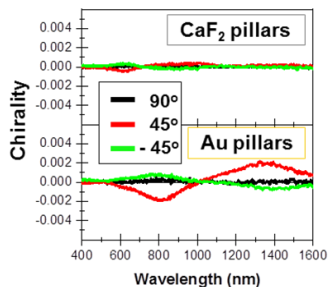


Figure 2: Spectra representing the chiral optical responses obtained from the Mueller Matrix elements according to the composition of the pillars [CaF_2 pillars a) and Au pillars b)] and the angle pillars-long optical axis of the rods.