

Growth and characterization of chiral gold nanorods

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Nanostructures with plasmonic functionalities have become an active topic of research. By controlling morphological parameters, optical properties of the nanostructures can be tailored with the applications in, for example, biosensing and gas areas and in integrated photonic devices for telecommunications. Considering the fabrication, hole-mask colloidal lithography (HCL) is a versatile method to produce randomly distributed nanostructures in large areas (over cm^2) such as discs, rings and crescent-shaped structures [1], as well as magneto-optically active nanostructures by combining noble metals with ferromagnetic metals.

In this work we present a complex structure formed by two gold nanorods [2] separated by a dielectric calcium fluoride (CaF_2) layer in a chiral configuration obtained by HCL.

Morphological properties of the nanostructure are studied with Atomic Force Microscope (AFM) and the optical properties are analyzed using the Mueller matrix elements in transmission, which allow discrimination between optical anisotropy and chiral effects.

Eventually, ferromagnetic components will be added into the system, and the response of the structure in the presence of magnetic field will be presented.

References

- [1] Fredriksson, H.; Alaverdyan, Y.; Dmitriev, A.; Langhammer, C.; Sutherland, D.S.; Zäch, M.; and Kasemo, B.; *Adv. Mater.*, 2007, 19, 4297–4302.
- [2] Armelles, G.; Cebollada, A.; García, F.; García-Martín, A.; and de Sousa, N; *ACS Photonics*, DOI: 10.1021/acsp Photonics.6b00670.

Figures

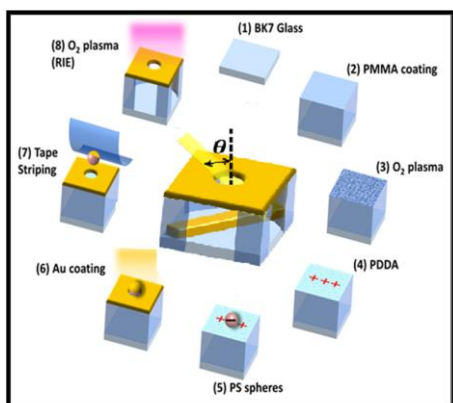


Figure 1: Diagram illustrating the basic process steps and resulting structures produced with HCL nanofabrication.

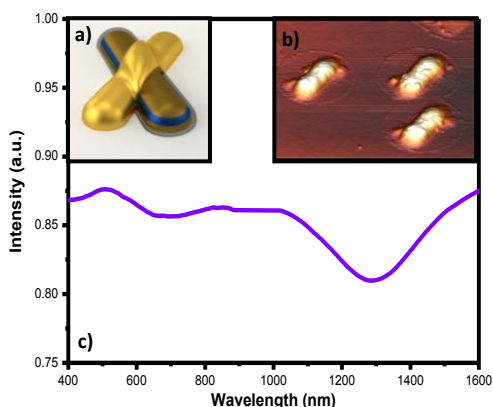


Figure 2: a) Schematic representation of some of the structures: Au rod on top of a Au/Co/Au nanorod. b) AFM image of crossed gold nanorods placed at 45 degrees each other c) Transmission spectrum of the sample shown in figure 2b. The dips are related with the plasmon resonances of the structure.