Control of gold nanorods linear assembly via topological defects of liquid crystal

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Research on gold nanorods has been a subject of great interest during the last years and it still leads to a large number of research works in different fields due to the multiple applications related to their optical and electronical properties.

In this research work, oriented topological defects of a smectic liquid crystal are used for confining and assembling gold nanorods and thus forming gold nanorod chains. Since the gold nanorods are strongly anisotropic, the use of liquid crystal defects orienting the rods along a single direction leads to localized surface plasmon resonance (LSPR) controlled by polarizations. The result of a linear assembly is then evidenced using LSPR measurements as a function of light polarization, the chain formation also leading to strong red-shifts of the longitudinal plasmon band for a polarization parallel to the liquid crystal defects. This phenomenon has been studied already for short chains [1], and we now study the evolution of the optical properties for long chains.

In a second step, fluorescent particles are also introduced and confined within the liquid crystal defect in coexistence with the gold nanorods. This generates an electromagnetic coupling in the system that modifies the optical properties of both fluorescent and gold nanorods. The enhancement/quenching of single molecule fluorescence near a plasmonic nanorods is studied as a function of the aspect ratio of the nanorods. The fluorescence lifetime evolution is studied also.

Reference

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