Master thesis proposal

Institut des Nanosciences de Paris
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Title: Quantum dot fluorescence and optomechanical coupling

Keywords: fluorescence, plasmonics, laser

Scientific description: The emission of colloidal quantum dots is highly dependent on their environment. Placed between two layers of gold, and excited in UV light, their emission couples with surface plasmons and its dynamics is accelerated. The smaller the gap between the two gold layers, the more the emission is modified. We propose to actively modify the spacing between the two layers in order to modify quantum dot emission.

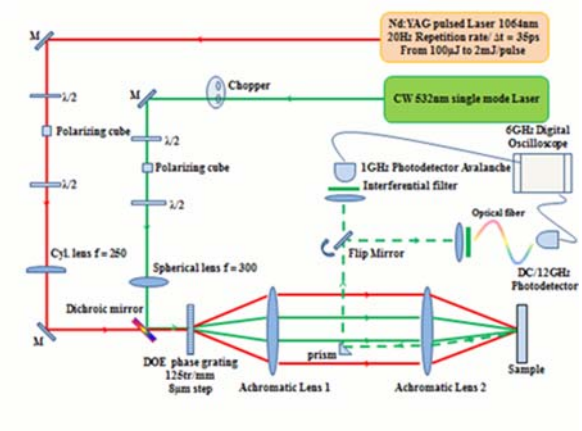

Figure 1 Scheme of the experiment. M (Mirror), DOE (Diffractive Optical Element), λ/2 (half wave plate)

We will use the transient grating method, which involves exciting the sample with two infrared laser beams (λ_{exc} =1064nm; 30ps pulse duration) to produce interference bangs with a period Λ. Through photoelasticity, the standing waves thus created cause the sample to vibrate, modulating its thickness.

The aim of the internship will be to study how the acoustic wave thus created modifies the properties of the light emitted.

The first step will be to produce the samples. After depositing an optically thick layer of gold on a glass subtrate, a solution of CdSe/CdS quantum dots will be deposited. This emitter layer is then covered by a thin layer of gold. Secondly, this layer will be optically characterized under a microscope, both to characterize its thickness in white light and the fluorescence of the quantum dots under UV illumination. Finally, we'll use the transient grating method to change the thickness of the sample. Both thickness and quantum dot fluorescence will be studied.

Techniques/methods in use: fluorescence, microscopy, spectroscopy

Applicant skills: optics, nanosciences, taste for experiments

Internship supervisors:

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Possibility for a Doctoral thesis: N