COLLOIDAL QUANTUM DOTS IN PEROVSKITE FIELD EFFECT DEVICES

LABORATORY : Institut Lumière Matière

LEVEL : M2
TEAM(S) : LUMINESCENCE

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SCIENTIFIC CONTEXT :

Colloidal quantum dot (CQDs) are solution-processed, nanometer-sized objects which emit light under electrical or photo-excitation. II-VI single CQDs emission suffers from blinking. Blinking behavior is associated to an ON/OFF characteristics in the emission timetrace of a single CQD. Blinking is the consequence of a charged CQD and affects negatively potential applications, such as lasers and LEDs, as well as prevent them from being used as Q-bits for the quantum information. In order to suppress this behavior, we propose an experiment where we control the CQD charge state by embedding them in a perovskite crystalline matrix connected electrically, which forms a field-effect device.

MISSIONS :

The aim of the internship is to characterize optically and understand the emission of quantum-dot-doped thin-films of lead-based perovskite, at the single quantum dot level, as a function of an applied electric field.

The trainee will have first to produce field-effect devices with CQD-doped thin perovskite films following the method previously developed in the team. The trainee will test the electrical response of the device on a newly acquired I-V test setup. The trainee will characterize it optically under a state-of-the-art confocal microscope. Optical characterization will include nanosecond lifetime measurement, fast antibunching for single photon emission, spectral fingerprint etc. as a function of an externally applied electric field. The trainee will then perform a detailed study of the blinking behavior of single CQDs as a function of an external electric field. Finally, the trainee will have to develop a feedback loop that commands the application of the external electric field to suppress blinking on single colloidal QDs.

OUTLOOKS :

The aim of the internship is to control blinking at the single quantum dot level.

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