Internship offered in M2
2018-2019

Responsibles for internship

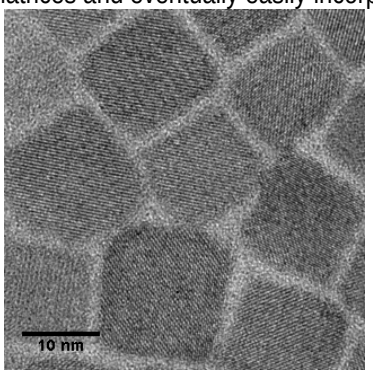
Names: Thierry Barisien, Laurent Legrand Group: PHOCOS
E-mail: barisien@insp.jussieu.fr, legrand@insp.jussieu.fr

Location : Campus Jussieu T 22-32 room. 219, 2d floor

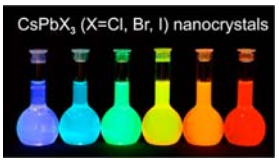
Tel: +33 (0)1 44 27 46 08

Internship topic: Perovskite nanocrystals for opto-electronics

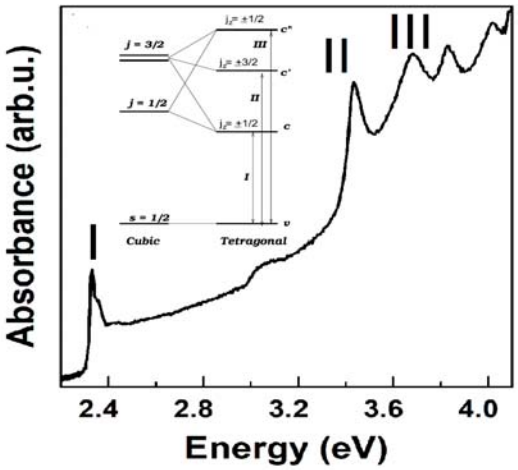
Colloidal semiconductor nanocrystals, typically 2-20 nm large, are systems where quantum confinement effect induces size-tunable emission wavelengths, discrete “atomic like” energy spectrum and enhances the probability of emission or absorption of photons. They are being intensively studied as future optoelectronic materials but also for bio-imaging and bio-diagnostic applications. Some of them are already used as the new generation of phosphors in industrial applications and are integrated in display. They have many advantages. Aside from having outstanding physical properties for example their bright emission properties, they are produced with low-cost chemicals methods and can be obtained as dispersed objects in films of transparent matrices and eventually easily incorporated into various devices.



MET of cubic nanocrystals



Solutions with nanocrystals of different size



Absorption and band-structure

Among these nanocrystals a new class has emerged since two years, namely, nanocrystals of caesium lead halide perovskites ($CsPbX_3$, X = Cl, Br, I) under the form of cubes and nano-platelets. The internship will be focused on the optical spectroscopies on this new class of nanocrystals. We aim at studying the emission properties of a *single* nanocrystal, free from inhomogeneous effects. The confinement will be varied with the size, form and/or composition of the synthetized nanocrystals in the laboratory. The emission properties will be studied on films where the nanocrystals will be sufficiently dispersed eg in a transparent matrix and addressed individually with a micro-photoluminescence set-up. The proposed studies are rather of fundamental nature; they allow gaining insights into the mechanisms that determine the intrinsic basic properties of confined systems. As already mentioned, colloidal nanocrystals are of interest in several fields like for instance in optoelectronics but also in photovoltaics where high conversion efficiency is required.

Applicant skills: taste for experimental work, good knowledge of condensed matter and light-matter interaction.

Techniques involved: Micro-photoluminescence, time-resolved luminescence, low temperatures studies using cryogenic setup, absorption spectroscopy, spin-coating.

Type of internship: experimental Paid internship: Yes
Can this internship be continued for a PhD? Yes
If yes, type of PhD funding envisaged is: doctoral school contract