CIRCULARLY POLARIZED NANO-EMITTERS SYNTHESIS AND CHARACTERIZATIONS FOR THEIR INTEGRATION IN CHIRAL PHOTONIC CIRCUITS.

LABORATORY : Institut Lumière Matière
IN COOPERATION WITH : iLM

LEVEL : M2
TEAM(S) : LUMINESCENCE
MNP

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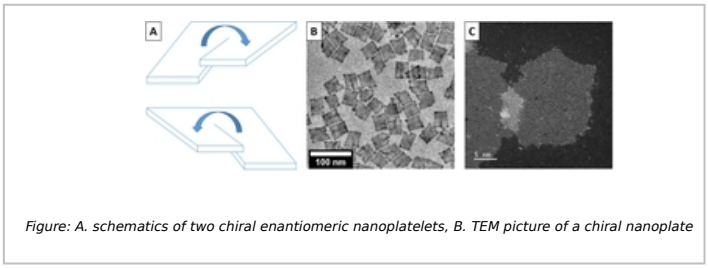

Figure: A. schematics of two chiral enantiomeric nanoplatelets, B. TEM picture of a chiral nanoplate

CIRCULAR POLARIZATION is the key information vector in the interactions between light and chiral objects such as chiral molecules or spin-selective quantum emitters. 1 It is also the polarization used for 3D projection systems and it allows to limit the optical interference due to scattering media. The generation of circular polarization is usually realized via a combination of phase plate and polarizer, which is cumbersome and energy consuming (half of the photons are unused). Circularly polarized luminescent (CPL) nano-emitters would then have applications in a broad range of domains from quantum cryptography to biology.

The aim of this internship is to synthesize and characterize new families of colloidal nanocrystals able to emit circularly polarized light. Two distinct systems will be explored in parallel:

· CdSe based core/shell nanoplatelets (figure A and B) that have a chiral shape and should exhibit chiral optical properties. These nanomaterials have the advantage to be really robust and efficient light emitters.

· Tungsten dichalcogenide nanomonolayers (figure C) for which we developed the first high quality colloidal synthesis2 and that can be highly polarized emitters.

MISSIONS :

During the project, the student will first synthesize highly fluorescent core/shell chiral NPLs and nanomonolayers using our new established protocols. He will then characterize the optical chirality of such nano-emitters dispersions using circular dichroism and CPL measurements down to the single nano-emitter scale. If the results are encouraging enough, the integration of these nano-emitters into a chiral photonic circuit will be envisioned.3

The project can be extended to a PhD through doctoral school funding depending on the student grades and examination success.

OUTLOOKS :

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