Responsable du stage	
Damien Garrot Laboratoire : Groupe d'Etude de la Matière Condensée CNRS-UVSQ (UMR 8635) Université de Versailles Saint-Quentin-en-Yvelines Tel: 01 39 25 46 03 E-mail: **damien.garrot@uvsq.fr** http://www.gemac.uvsq.fr	Emmanuelle Deleporte Laboratoire : Laboratoire Lumière, Matière, et Interfaces LuMIn–ENS Paris-Saclay Tel : 01 69 35 20 24 E-mail: **emmanuelle.deleporte@ens-paris-saclay.fr** http://www.noos.universite-paris-saclay.fr/
Lieu du stage : GEMaC (Versailles) et LuMIn (Université Paris-Saclay, ISMO, Bât 520)	

Titre du stage / *internship title*: **Excitonic properties of 2D hybrid perovskites**

Halide perovskites (HPs) have recently emerged as a promising new class of semiconductors. In only a few years, the efficiency of solar cells based on HP has exceeded 25%, close the best silicon solar cells. They are also intensely investigated for the realization of light emitting devices (Laser, LED). They can be synthetized as bulk material but also in the form of low dimensional 2D layered perovskites and 0D quantum dots. They achieved the unique feat to be high-performance, high quality semiconductors and simultaneously low cost solution-processable materials. The reasons behind their remarkable properties are still not fully understood. A better fundamental knowledge of their photophysical properties could be crucial to remove the last obstacles to the wide spread application of HPs.

During the internship, the student will investigate the optical properties of HPs with a special emphasis on the properties of low dimensional 2D layered HP. They formed self-assembled multi-quantum well structures with inorganic layers sandwiched between large organic cations (Figure 1). Due to quantum and dielectric confinement, strongly bound excitons can be formed at room temperature. [1,2]

The studies will be based on a combination of time-resolved micro-photoluminescence (PL), PL excitation and absorption spectroscopy, at room and cryogenic temperature. The objective will be to achieve a better understanding of the radiative and non-radiative recombination processes and of the impact of defects and electron-phonon coupling. [3] In the long term, we aim at a control of these radiative and non-radiative processes based on the chemical engineering of low dimensional HP, in order to optimize the efficiency of optoelectronics devices.

The student will join a team of physicists and chemists (6 permanent staff), with a long experience and an expertise in the optical spectroscopy and chemistry of HPs. The team is also strongly implied in the application of halide perovskites to solar energy conversion and light emitting devices.[4]

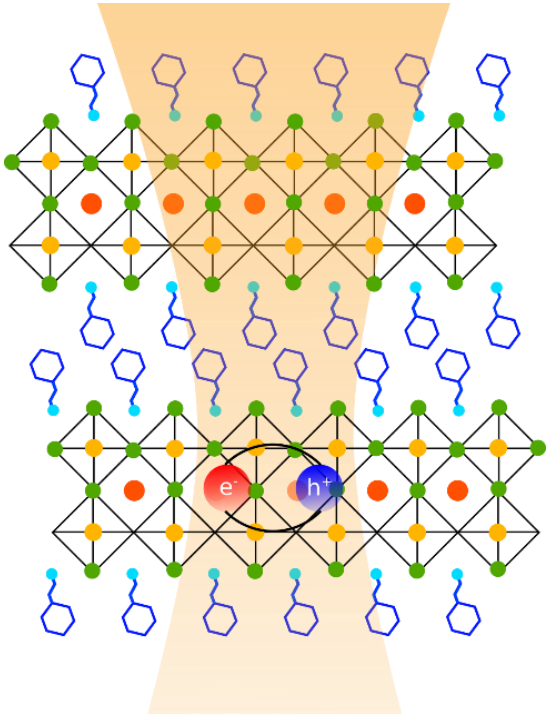

Figure 1: Schematic representation of the photogeneration of excitons in a 2D halide perovskite, formed of inorganic layers (PbI_6 octahedra) and large organic molecule (phenylethylammonium, in blue)

[1] G. Delport *et al.* **J. Phys. Chem. Lett.** 10, 5153-5159 (2019)
[2] F. Lédée *et al.* ***CrystEngComm*** **19** (19), 2598--2602. (2017)
[3] H. Diab *et al.* **J. Phys. Chem. Lett. 7**, 5093--5100. (2016)
[4] P. Bouteyre *et al.* **ACS Photonics** 6, 1804-1811 (2019)

Ce stage pourra-t-il se prolonger en thèse ? *Possibility of a PhD* **? :oui/yes**

Si oui, financement de thèse envisagé/ *financial support for the PhD*: **Contrat doctoral**