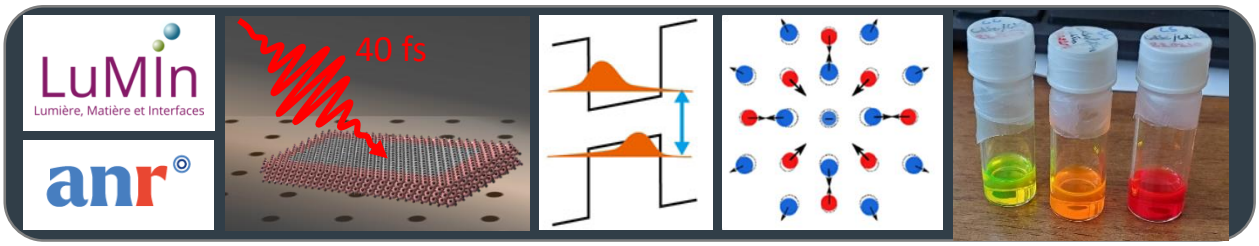
English version

18-month postdoctoral position on:

Charge transfer excitons in 2D hetero-structures studied by TR-Stark spectroscopy

The development of two-dimensional (2D) semiconductor materials has been greatly stimulated by the outbreak of ultrathin nanostructures with thickness controlled at the atomic level. Among them, colloidal nanoplatelets (NPLs) of metal chalcogenides and halide perovskite, with their large absorption cross section and high photoluminescence quantum yield, have shown their high potential for light-emitting applications (LEDs & lasers) [1-3]. Electronic coupling between NPLs, notably through the development of 2D heterostructures, is now the next challenge to tackle for applications based on light-to-electricity conversion.



So far, the coupling between vertically (cofacial)-stacked NPLs and within in-plane (edge-to-edge) hetero-NPLs strongly suffers from the poor quality control of the interface [4-5]. In this project, femtosecond transient absorption and picosecond photoluminescence with a streak camera, will be used to study charge transfer (CT) excitons in 2D NPL heterostructures with both in-plane and out-of-plane geometry and type-II alignment. The original samples will be provided by our collaboration a the iLM lab in Lyon [6], in collaboration with the ICB in Dijon. CT excitons will be engineered with optical properties controlled with external electric fields, by tuning the energy level offset, the electron and hole wavefunction delocalization and relative overlap.

Context: Fundamental project funded by the ANR agency, that requires experimental developments (time-resolved Stark spectroscopy).

Competences: The candidate must hold a PhD with background in Physical Chemistry or Physics. She/he should be highly motivated and ideally already have an experience on time-resolved optical spectroscopy.

Location: LuMIn, Université Paris-Saclay, bâtiment 505, rue du belvédère, 91405 Orsay.

Type of contract: 18 months ENS Paris-Saclay contract (full time)

References: [1] Ithurria&Dubertret, Nature Mater. 10, 936 (2011)
[2] Villamil Franco&Cassette, JPC Lett. 13, 393 (2022)
[3] Villamil Franco&Cassette, ACS Appl Nano Mater (2021)
[4] Cassette&Scholes, PCCP 19, 8373 (2017)
[5] Pandya&Rao, JACS 140, 14097 (2018)
[6] Martinet&Mahler,Nanoscale (2021)

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