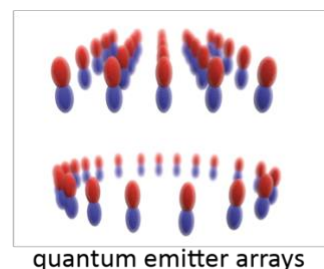
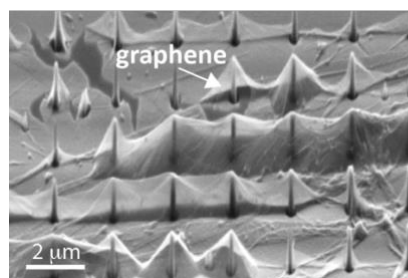


PhD proposal on quantum nano-photonics with 2D materials

The **2D material research group at CRHEA** is looking for well-qualified, highly motivated and dynamic PhD candidate who wish to enhance his/her scientific career in a friendly and stimulating environment within the field of quantum nano-photonics. The goal of this project is to build the first sub- λ solid-state array of quantum emitters using 2D crystals thanks to their ability to be draped over a rough substrate. This forms a dynamical quantum photonic crystal, in which each lattice site can be independently tuned. By harnessing near-field and quantum collective effects (e.g. sub-radiance, super-radiance), we propose a unique approach for controlling light-matter interactions at the nanoscale. One objective is to control in situ the emission of single photon sources in 2D semiconductor such as MoSe₂. In itself, it would be the very first realization with such materials, with strong impact for integrated 2D quantum photonics community. We also aim at studying Near-field interactions between quantum emitters, a topic that include very fundamental questions such as the coupling between 2D phonons and 0D quantum emitter. Concretely, these questions directly impact emerging quantum technologies in nano-photonics (e.g. manipulation of the degree of entanglement) as well as condensed matter community (e.g. new probing schemes using quantum collective effects).

References:

- **Quantum Nanophotonics in Two-Dimensional Materials.** A. Reserbat-Plantey *et al.* ACS Photonics. 2021
- **Strain Superlattices and Macroscale Suspension of Graphene Induced by Corrugated Substrates.** A. Reserbat-Plantey *et al.* Nano Letters. 2014
- **Large-scale quantum-emitter arrays in atomically thin semiconductors.** C. Palacios-Berraquero *et al.* Nature Comm. 2017



Requirements:

- Master's degree (or equivalent or higher) in physics, photonics, condensed-matter or any related discipline
- Interest in the development of new optics experiments and nanofabrication techniques
- Experience in Python and CAD software are advantageous, but not requisite.
- Good organizational skills and team spirit.

Responsibilities:

- Scientific contribution to the project, literature review, experiment planning, data analysis.
- Experimental development of cryo-optics lab and 2D quantum devices production.
- Close collaboration with the project partner.
- Presentation of research findings on international conferences as well as publication of findings in English.

→ In case of interest, candidates may contact Dr. Antoine Reserbat-Plantey (arp@crhea.cnrs.fr) for further details.