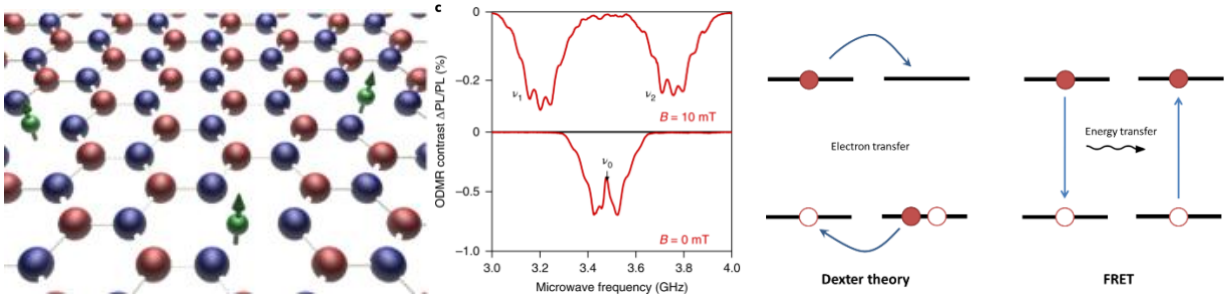
School of Engineering (STI)
Institute of Bioengineering (IBI)
Laboratory of Nanoscale Biology (LBEN)

Surface Functionalization to Enhance Energy Transfer Between Organometallic Compounds and Defects in hBN

Our group is interested in using 2D materials and optics to create ultra-sensitive sensors. hBN is an insulating and thus transparent 2D material that that can host defects which absorb and emit light in the visible range. The role of the student will be to investigate surface coating conditions to enable energy transfer between organometallic compounds and defects in order to enhance the fluorescent emission from defects. These defects are highly appealing for use in ultrasensitive sensing. In this project, the student will have the opportunity to learn about energy transfer and imaging techniques as well as (time permitted) photonics techniques such as emission/excitation polarization and optically detected magnetic resonance (ODMR). Energy transfer can occur via different mechanisms but in either case requires nanometrically close contact close contact between donor and acceptor (for example the long-range fluorescence resonance energy transfer, or shorter ranger dexter energy transfer). In this project we consider that not only proximity, but relative orientation of the donor and acceptor are important. We also consider that some surface functionalization methods may create other undesirable defects in the material. The student will be responsible for using different functionalization techniques and then surveying various fluorescent compounds and imaging the result on high resolution microscopes. Thus, students with interest in energy transfer, 2D materials, imaging, and surface functionalization are strongly encouraged to apply.



A and n from Reference[1]. Reading on triplet energy transfer in Reference[2]

Required knowledge:
Must have worked in a wet chemistry lab before. Experience with surface functionalization and/or nanomaterials is preferred.

Supervisor: Eveline Mayner (Eveline.mayner@epfl.ch)
Supervising Professor: Prof. Aleksandra Radenovic (aleksandra.radenovic@epfl.ch)

Related Publications:

1. Gottscholl, A. *et al.* Initialization and read-out of intrinsic spin defects in a van der Waals crystal at room temperature. *Nat. Mater.* **19**, 540–545 (2020).
2. You, Z.-Q. & Hsu, C.-P. Theory and calculation for the electronic coupling in excitation energy transfer. *Int. J. Quantum Chem.* **114**, 102–115 (2014).