M2 / PhD proposal

Ultrathin Chiral Nanoplatelets

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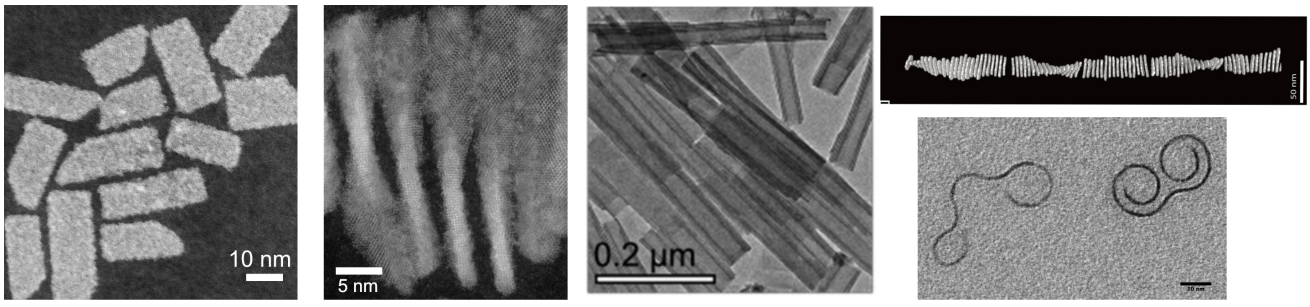
Semiconductor nanoplatelets boast fascinating optical properties thanks to their very thin thickness (less than 2 nm), controlled down to the atomic layer. These objects are attracting a great deal of interest from the scientific community because of their potential use in a variety of applications (lighting, optoelectronics). We have recently shown that the organic molecules bonded to the surface of nanoplatelets impose a mechanical stress that is sufficient to significantly deform them. Indeed, their very low thickness makes the energy required for their deformation very low, and our working hypothesis is that the constraint imposed by the ligands enables us to finely tune the shape of the nanoplatelets. All shapes obtained by deforming a plate, such as tubes, helices or helicoids, are therefore potentially accessible *via* this strategy.

The aim of this project is to gain a better understanding of this shape change and the chirality of objects by functionalizing model nanoplatelets with different organic molecules. The work will involve synthesizing chiral nanoplatelets using protocols already developed by our team, then characterizing them using various techniques (UV visible spectroscopy, dynamic light scattering, small-angle X-ray scattering, transmission electron microscopy). We will then study the chirality induced by different chiral molecules during synthesis or after ligand exchange. We are particularly keen to explore circular dichroism and the variation in intensity of the different bands as a function of temperature. We are looking for a student chemist or physical chemist with an interest in nanoparticle synthesis, functionalization and spectroscopy. This internship could be extended by a thesis on the same theme, with ERC, CDSN or doctoral school funding. Further informal inquiries and/or discussions are welcome.



Références:
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- S. Jana, M. De Frutos, P. Davidson and **B. Abécassis**. Ligand-induced twisting of nanoplatelets and their self-assembly into chiral ribbons, ***Science Advances***, e1701483, 2017.
- Castro, N., Bouet C., Ithurria, S., Lequeux, N., Constantin, D., Levitz, P., Pontoni, D. and **Abécassis, B.*** Insights into the Formation Mechanism of CdSe Nanoplatelets Using in Situ X-ray Scattering, ***Nano Letters*** 19, 9, 6466-6474 (2019).