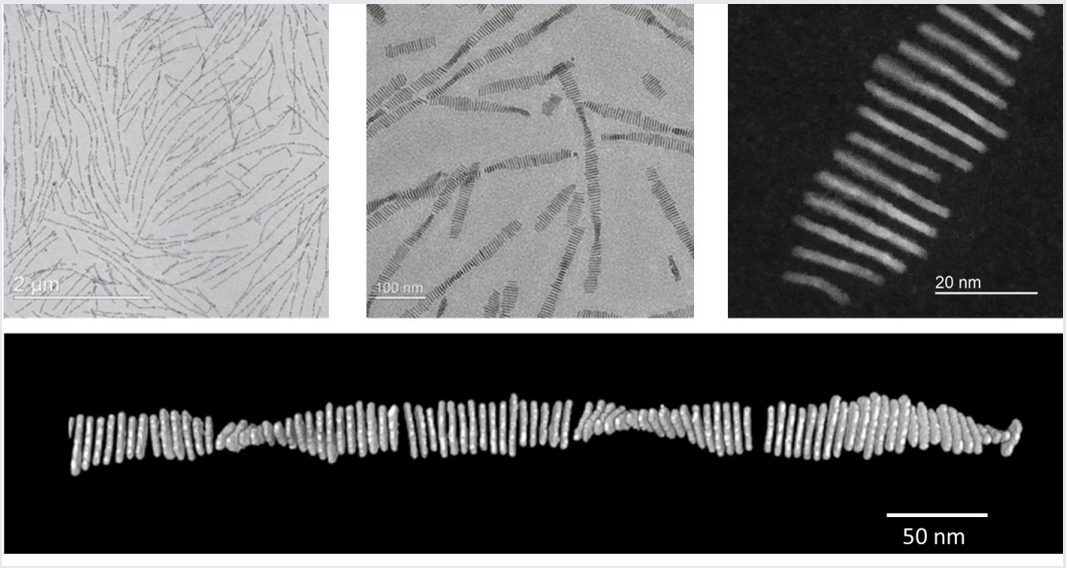
Chiral self-assemblies of semiconducting nanoplatelets

S. Jana, M. de Frutos, P. Davidsdon, B. Abécassis (LPS)

Researchers from Laboratoire de Physique des Solides in Orsay and Laboratoire de Chimie of ENS Lyon just discovered a new way of elaborating chiral nanostructures by exploiting the mechanical stresses induced by organic molecules at the surface of disc-shaped nanoplatelets. For this purpose, they used rectangular semiconducting CdSe nanoplatelets that behave as quantum wells, with remarkable spectroscopic properties (pure fluorescent emission, low lasing threshold…), that currently raise much interest worldwide. They showed that increasing the concentration of organic molecules at the surface of these objects induces strong steric stresses that bring about a twist deformation of these nanoplatelets. Because they are very thin (slightly more than a nanometer), these nanoparticles are very flexible et strongly deform when submitted to a mechanical stress. Moreover, when these nanplatelets spontaneously stack in ribbons, the mechanical stresses propagate and twist the ribbons which form helical structures, with a pitch of a few hundred nanometers. Naturally, in the absence of any source of macroscopic chirality, the two types (left-handed and right-handed) of helices are equally observed. This discovery can potentially be applied to other disc-like nanoparticles and opens the way toward chiral nanoparticle assemblies that may have original spectroscopic properties (circular dichroism, polarized emission…), as recently predicted by theoretical studies.



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