

# Architecturing the inorganic core and the organic shell of II-VI semiconductor NPLs

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Two-dimensional II-VI semiconductor nanoplatelets (NPLs) present exceptionally narrow optical features due to their thickness defined at the atomic scale. Architecturing the inorganic core and the organic shell of ligands enable to tune their optical features and their shapes.

With core/crown/crown heterostructured NPLs, we are synthesizing NPLs that exhibit green and red emissions from a single population of NPLs. This type of nanocrystals is of interest for displays where a mixture of green and red emitters is necessary. In particular, in CdSe/CdTe/CdSe core/crown/crown NPLs, the exciton either recombine at the interface between 2 semiconductors due to the type II band alignment or in the CdSe area. And, the ratio of the two emissions can be tuned by the incident power.

On the other hand the organic shell of ligands can also be modified. The native carboxylate ligands can be replaced by halides ligands co-stabilized by amines. The improved surface passivation leads to an increase in the fluorescence quantum efficiency. At high temperature, these halides ligands can also partially dissolve cadmium chalcogenide NPLs through the edges. The released monomers then recrystallize on the wide top and bottom facets, leading to an increase in NPL thickness. This dissolution/recrystallization process is used to increase NPL thickness from 3 MLs to 9 MLs in steps of 2 monolayers. Besides, the lateral dimensions of NPLs can be extended over thousands of nm<sup>2</sup> and this surface can be used for the self-assembly of ligands. While choosing the right surface chemistry, it is possible to tune the shape of the NPLs from helices more or less curled in one direction, to unfolded NPLs and finally helices curled in the other direction. The radius of the helices is due to the inorganic particle, the anchoring group of the ligands and the aliphatic chain of the ligands.