Minicolloque OS 02 :Colloidal semiconductor nanocrystals and their applications

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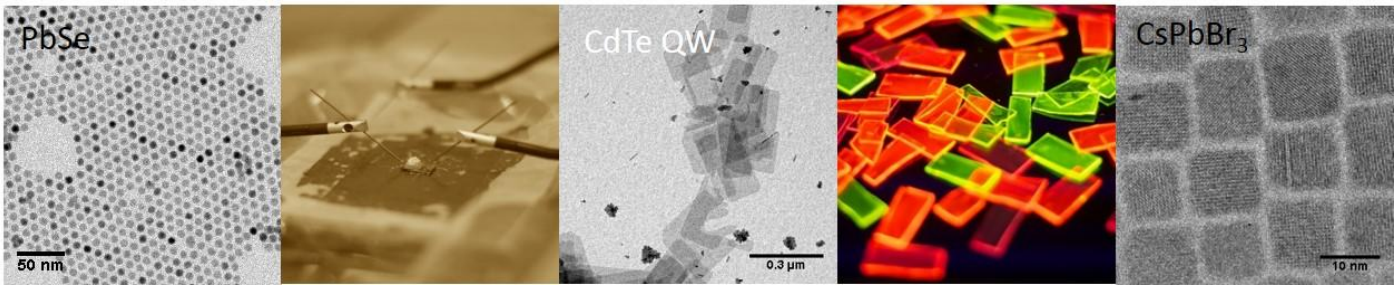
Colloidal nanocrystal synthesis has finally reached a high level of maturity. Thanks to 20 years of development, it is now possible to grow, in solution, semiconductor nanocrystals with controlled size and shape[1] as well as complex heterostructures. Over the recent years, huge efforts have been done to broad the range and complexity of materials available throughcolloidal chemistry. Different strategies have allowedto expand their optical properties up to the infrared[2] (lead and mercury based materials), limit their fluorescence blinking (thick-shell structures[3]), achieve single photon sources[4]….In addition, the research has also been focused on the nanocrystals surface chemistry in order to allow water transfer or to improve electronic inter-dot coupling[5].

The range of colloidal quantum dotsapplications now spans from bio-imaging up to optoelectronic devices. The field has even reached a higher level of maturity with the integration of quantum dots as the next generation of phosphor material for displays by mass consumer electronic companies such as Samsung, Sony, LGorAmazon.

This mini-colloquium will discussed both some material aspects as well as their applications:

- Colloidal nanocrystal synthesis: new shapes, heterostructures and materials including TMDCs[6] and perovskites[4] materials. The discussion may be expanded up to industrial production.
- Structural characterization, in particular using original tools such as TEM tomography, GISAXS, XPS…
- Self-assembly of colloidal nanocrystals[7].
- Electronic structure measurements including direct measurement of the band structure (UPS, ARPES, tunnel spectroscopy), band engineering and electronic structure calculation (DFT, tight binding…)
- Optical properties of nanocrystals (e.g. fine structure investigation[8], stimulated emission[9], lasing) and spectroscopic techniques such as time resolved spectroscopy, single particle spectroscopy, infrared spectroscopy, 2D spectroscopy[10],..
- Optoelectronic device applications: nanocrystal based field effect transistors[11], LED, photovoltaic and photodetectors. Hybrid devices[12] based on colloidal nanocrystals can also be discussed.

This colloquium will be an opportunity to exchange between the different communities exploring the fieldsrelated to colloidal nanocrystals, from growth-oriented people tothe end-users of these materials. The talks will be given in English.



From left to right (i) TEM image of PbSe nanocrystals, (ii) image of µ-probe connected to a nanocrystal-based field effect transistor (iii) TEM image of CdTenanoplates, (iv) image of nanocrystal coated glass slides, (v) TEM image of $CsPbBr_3$ nanocrystals.

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