Wavefunction engineering in semiconductor colloidal quantum dots for light emission

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The research on the fabrication of highly efficient optoelectronic devices has been tremendously expanded the last decades, mainly thanks to the development of new materials which either substitute or incorporate with conventional ones. Nowadays, a plethora of semiconductor materials is already being used in optoelectronic devices such as solar cells, lasers, transistors, light emitting diodes (LED's) and photodetectors. In recent years, colloidal semiconductor nanocrystals (NC's) have attracted considerable attention due to their excellent optoelectronic properties such as tunable band-gap, enhanced photoluminescence quantum yield (PLQY) and high optical stability[1], which categorize them as a promising candidate to complement conventional technologies where tunable band-gap, large area, mechanical flexibility and low cost processing are required.

Colloidal nanocrystals become even more appealing thanks to versatile synthesis which offers a vast variety of tools to manipulate the shape,[2] the size[3] and the composition of the nanocrystals in atomic level, extending the degree of control over their optoelectronic response. Here, we are going to discuss about how we can precisely tune the QD's properties on dmand, via wet chemistry and surface functionalization while we are going to demonstrate how these materials shaped the state-of-the-art light emitting optoelectronic devices such as LED's[4] and lasers[5,6].

References:

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