

Development of new colloidal nanocrystals for energy related applications

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About the Project

The need to accelerate decarbonization is increasingly pushing research toward the development of new materials that can be used in energy conversion devices and/or that can decrease the energy demand of devices (for example light emitters). Solar cells or solar concentrators, for instance, enable the direct conversion of the solar energy into electrical power, thus generating "green" energy. Also, the pervasive use of light emitting diodes (LEDs), which are currently the most efficient light sources, is lowering the power required in lighting and displays. Colloidal semiconductor nanocrystals (NCs) have been shown to be promising materials for low-cost and high efficiency solar cells, solar concentrators and LEDs thanks to their unique properties and to the low costs associated with their synthesis. The optical properties of colloidal NCs can be finely tuned to match the required standards, and the NCs, in the form of inks (i.e. dispersion of NCs in a desired solvent) can be readily employed in low cost ink-jet processes for the fabrication of devices. This research activity will be first focused on the synthesis of nanocrystals (targeting metal halide perovskites, metal chalcogenides and chalcogenides) and their complete (structural, chemical, surface and optical) characterization. Such materials will be engineered in order to optimize their optical and electrical properties. Possible strategies to be developed are the encapsulation of nanocrystals in proper inorganic shells (with the formation of nano-heterostructures), ligand and/or ion exchange procedures, for their subsequent use in devices.

Requirements: The ideal candidate must have a Master Degree in one of the following areas: Material Science, Chemistry, Chemical Engineering or Physics.

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