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From conventional colloidal nanocrystals to novel nano-heterostructures for energy applications

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Abstract

Enormous progress in syntheses and characterization of monodisperse colloidal semiconductor nanocrystals (NCs, also known as quantum dots, QDs) has been made since the discovery of quantum-size-effects almost three decades ago. A particularly difficult challenge in the chemistry of NCs is their detailed structural and chemical analysis of NC surfaces on atomistic level, limiting further progress in rational synthesis of such entities. An atomically precise image of the NC surface was not entirely discussed so far. Therefore, building the atomistic picture of ligand-capped NCs requires a powerful combination of modern experimental tools and atomistic modeling. From visible range to far infrared, we developed new materials such as perovskite halide nanocrystals (APbX3) with superior photophysical quality previously achievable only with Cd-chalcogenides of complex compositions and morphologies such as core-shell CdSe/CdS NCs. Moreover, the symbiosis between CsPbX3, and metal organic frameworks (MOFs) will be discussed. Those novel heterostructures enable the understanding of the photophysical properties of metal halide perovskites QDs under strong confinement and provide a solid approach for developing novel lead-free perovskite QDs for optoelectronic applications..

Biography:

Dr. L. Protesescu has completed her PhD in 2016 from ETH Zurich (ETH Medal and best PhD thesis) and the Postdoctoral Studies from MIT, USA. She is assistant professor for chemistry of nanomaterials at University of Groningen, Zernike Institute for advanced Materials. She published more than 50 papers and she has already a significant contribution to the perovkite nanomaterials field.

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