

Optical properties of all-inorganic perovskite nanocrystals

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All-inorganic cesium lead halide perovskite nanocrystals (NCs, CsPbX₃ NCs, X = Cl, Br, I) attract much attention recently due to their outstanding optical properties. Here I will discuss our recent results concerning three important aspects of their microscopic characteristics: (i) an explicit demonstration of a relation between NC size and shape with their bandgap, and the effective coupling between proximal NCs; (ii) simultaneous formation of insulating Cs₄PbBr₆ nanohexagons and Cs₄PbBr₆/CsPbBr₃ hybrid nanospheres during the standard synthesis of CsPbX₃ NCs; and (iii) spontaneous merging of drop-casted colloid at room conditions by seamless stitching of aligned NCs. The latter process is accelerated by humidity and heat treatments, while arrested with electron beam irradiation. Further, I will present some detailed information on carrier dynamics in perovskite NCs, their water-resistant encapsulation [5], and on energy exchange within their ensembles obtained by using high-resolution induced absorption and emission spectroscopies. Finally, I will also discuss the most recent results concerning successful observation of efficient carrier multiplication in CsPbI₃

References

[1] L. Gomez et al. ACS Appl. Mater. Interfaces, 10, 5984 (2018)

[2] Ch. de Weerd et al. Nature Communications, 9, 4199 (2018).