Single $CsPbX_3$ Perovskite QDs at Room Temperature

Gabriele Rainò

[1] Institute of Inorganic Chemistry, Department of Chemistry and Applied Biosciences, ETH Zürich, CH-8093 Zürich, Switzerland

[2] Laboratory for Thin Films and Photovoltaics, Empa – Swiss Federal Laboratories for Materials Science and Technology, CH-8600 Dübendorf, Switzerland

Lead-halide perovskite $APbX_3$ (A=Cs or organic cation; X=Cl, Br, I) quantum dots (QDs) are subject of intense research due to their exceptional properties as both classical[1] and quantum light sources.[2-4] Here, we report a comprehensive investigation of the room temperature single QD optical properties. The results reveal the origin of the QD homogeneous PL linewidths, and the peculiar size-dependent exciton photoluminescence line broadening and the exciton and multi-excitons recombination dynamics. Experimental results are corroborated by ab-initio molecular dynamics.

Such findings guide the further design of robust single photon sources operating at room temperature.

References

[1] Akkerman *et al., Genesis, challenges and opportunities for colloidal lead halide perovskite nanocrystals.* Nat. Mater. **17**, 394–405 (2018).
[2] Becker *et al., Bright triplet excitons in caesium lead halide perovskites.* Nature **553**, 189–193 (2018).
[3] Rainò *et al., Superfluorescence from lead halide perovskite quantum dot superlattices. Nature* **563**, 671–675 (2018).
[4] Utzat *et al., Coherent single-photon emission from colloidal lead halide perovskite quantum dots.* Science **363**, 1068–1072 (2019).

This project was funded by the European Union's Horizon 2020 program, through a FET Open research and innovation action under the grant agreement No 899141 (PoLLoC) and by the Swiss National Science Foundation (grant number 200021_192308), project Q-Light.