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Cooperative Emission and Structural Coherence in Self-Assembled Perovskite Nanocrystals

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ABSTRACT: Colloidal metal halide nanocrystals took materials science by storm since their emergence several years ago. Exemplified by cesium lead halide perovskites, such materials show bright and tunable photoluminescence and are cheap and deceptively simple to make. On the one hand, these characteristics spurred applications of colloidal perovskites as low-cost phosphors in LEDs, color converters, and light absorbers in thin-film solar cells. On the other hand, intense attention has uncovered phenomena unique to or remarkably pronounced only in colloidal metal halides. In this talk, I will discuss my pursuit of two such phenomena: the search for cooperative light emission (superfluorescence) and the discovery of structural coherence in metal halide nanocrystal superlattices.

Short BIO: Dmitry Baranov was born in 1986 in Obninsk, Russia, and received his Diploma in Chemistry from the Higher Chemical College of Russian Academy of Sciences in Moscow in 2008, M.Sc. from the University of Chicago in 2011, and a Ph.D. from the University of Colorado-Boulder in 2017. He then joined NACH-IIT as a postdoctoral researcher and then as Marie Skłodowska-Curie Individual Fellow to study energy transfer in nanocrystal assemblies in 2018–2020. Currently, he studies collective optical properties in superlattices of lead halide perovskite nanocrystals.

Key references

Baranov et al., ACS Nano 2021, 15, 1, 650–664

Toso et al., ACS Nano 2021, 15, 4, 6243–6256

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