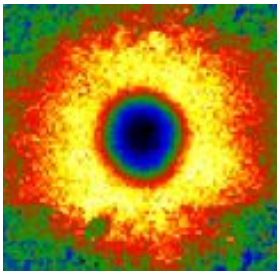

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# Nanoscale physics of perovskite materials observed by optical micro-spectroscopy: from quantum dots to films

All-inorganic, as well as organic-inorganic hybrid halide perovskites are one of the most promising class of semiconductors for new generation of energy conversion and optoelectronic applications. While there has been tremendous technological progress in device development, especially in the field of perovskite solar cells, the advancement of the knowledge of fundamental photophysical properties of perovskite materials, which is equally important for further progress of the field has been lacking behind. This contribution reports on the study of nanoscale structural and optical properties of various perovskite materials, ranging from nanocrystals, to 2D/3D heterostructures and to mixed cation perovskite films, using single-molecule fluorescence microscopy and spectroscopy. The use of this technique helps to uncover properties that are otherwise inaccessible using conventional characterization methods. Specifically, we examine the origin of photoluminescence (PL) and electroluminescence (EL) blinking in individual perovskite nanocrystals [1-3], monitor in real time nanocrystal formation and ion migration in perovskite-metal organic frameworks composites [4], observe dynamic restructuring at the interface between 2D and 3D perovskite nanostructures, and study nanoscale structural heterogeneity and properties in a series of mixed cation halide perovskite films.

References:
[1] D. K. Sharma, S. Hirata, M. Vacha, Nat. Commun. 2019, 10, 4499
[2] D. K. Sharma, S. Hirata, V. Biju, M. Vacha, ACS Nano 2019, 13, 624
[3] T. Takagi, S. Omagari, M. Vacha, Phys. Chem. Chem. Phys. 2023, 25, 19004
[4] X. Wu, S. Omagari, J. Gao, M. Vacha, Adv. Opt. Mater. 2024, 12, 2301479
[5] A. Agarwal, S. Omagari, M. Vacha, ACS Energy Lett. 2022, 7, 2443
[6] A. Agarwal, S. Omagari, M. Vacha, Nanoscale 2023, 15, 10642

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