Polycarboxylates as synthetic tools for small and efficient perovskite quantum dots

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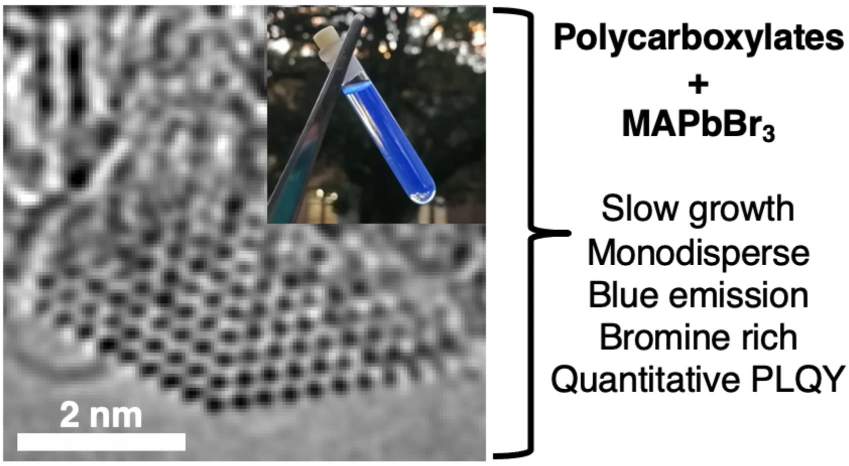
Nanosized lead halide perovskites have gained tremendous interest for light emitting applications over the past few years due to their easy synthesis and color tunability over the entire visible spectra[1]. More precisely, blue light emission is usually achieved via chloride-bromide mixed systems, or by an increase in the confinement of pure bromide quantum dots. However, small pure bromide quantum dots are still lackluster performance-wise with poor stability[2], or require numerous post-treatments[3].

Here we developed a new synthetic method based on polycarboxylates used as replacement to the standard Oleic Acid. By sharply decreasing the kinetics of dots' formation, we drastically improved the performances of the material. Our method yields small (2.5nm in diameter), deep blue perovskite quantum dots with quantitative quantum yield and enhanced stability. We attributed the excellent performances to an in-situ bromine enrichment, enabled by the polycarboxylate. We investigated the role of the ligand and found out polycarboxylates are weakly bound to the edges of the dots and act solely as synthetic aids. Our results highlight the critical impact of polydentate ligands onto quantum dot formation mechanisms leading to dramatic changes in the performances of the resulting dots.



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