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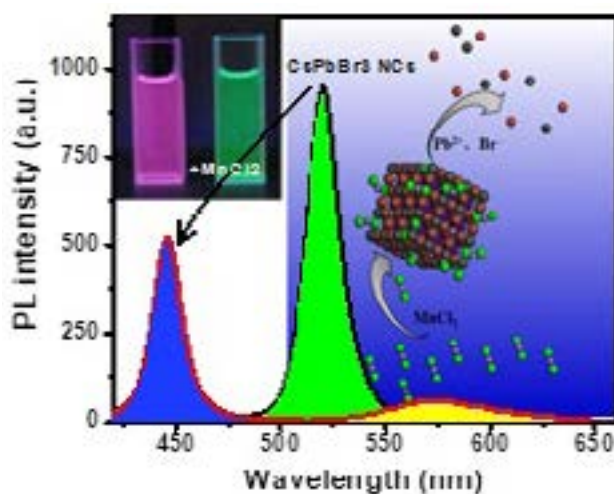
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Molecule doping strategy and its application for Mn doped CsPbCl_xBr_{3-x} nanocrystals

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Unlikely to widely used post-synthetic halide exchange for CsPbX₃ (X is halide) perovskite nanocrystals (NCs), the cation exchange of Pb cation is of great challenge due to the rigid nature of Pb cationic sublattice. Actually, cation exchange has more potential for rendering NCs with peculiar properties. In this work, we developed a novel halide exchange-driven cation exchange strategy to prepare dually emitted Mn-doped CsPb(Cl/Br)₃ NCs via post-synthetic replacement of parts of Pb in preformed perovskite NCs. The basic idea is that the partial cation exchange of Pb by Mn has a large probability to occur as a concomitant result for opening the rigid octahedron structure of Pb during halide exchange. Compared to traditional ionic exchange, halide exchange-driven cation exchange is featured by proceeding of halide exchange and cation exchange at the same time and the same lattice site. The time and space requirements lead to only MnC₁₂ molecules (rather than mixture of Mn and Cl ions) capable of doping into perovskite NCs. This special molecular doping nature gives rise to a series of unusual phenomenon, including extremely long time for MnC₁₂ molecules diffusing into NC lattices, core-shell structured mid states with triple emission bands, and dopant molecules composition dependent doping process. As-prepared Mn-doped CsPb(Cl/Br)₃ NCs have dual emission bands from both perovskite intrinsic emission and Mn dopant emission, and hence available for ratiometric temperature sensing.



Biography

Guangguang Huang, Ph.D of Southeast University, P. R. China in optical engineering. His researches are focus on synthesis of nanocrystals and their related photoelectric application. Recently, he realized cation exchange in perovskite NCs via molecule doping strategy and synthesized the functionalized Mn-doped dual-emitting perovskite NCs for ratiometric temperature detection.

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