Ag-Doped Halide Perovskite Nanocrystals for Tunable Band Structure and Efficient Charge Transport

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ABSTRACT: Heterovalent doping of halide perovskite nanocrystals (NCs), offering potential tunability in optical and electrical properties, remains a grand challenge. Here, we report for the first time a controlled doping of monovalent Ag^{+} into $CsPbBr_3$ NCs via a facile room-temperature synthesis method. Our results suggest that Ag^{+} ions act as substitutional dopants to replace Pb^{2+} ions in the perovskite NCs, shifting the Fermi level down toward the valence band and in turn inducing a heavy p-type character. Field effect transistors fabricated with Ag^{+}-doped CsPbBr3 NCs exhibit 3 orders of magnitude enhancement in hole mobility at room temperature, compared with undoped $CsPbBr_3$ NCs. Low-temperature electrical studies further confirm the influence of Ag^{+} doping on the charge carrier transport. This work demonstrates the tunability of heterovalent doping on the electrical properties of halide perovskite NCs, shedding light on their future applications in versatile optoelectronic devices.