Abstract

The development of solution-processed inorganic metal halide perovskite light-emitting diodes (PeLEDs) is currently hindered by low emission efficiency due to morphological defects and severe non-radiative recombination in all-inorganic perovskite emitters, as well as the light trapping by substrate and waveguide modes. In this talk, we will introduce our recent progress on bright PeLEDs.The synergetic morphology control over cesium lead bromide (CsPbBr3) perovskite films was realized with the combination of two additives, enabling the formation of pinhole-free mixed-dimensional perovskite film featuring efficient energy funneling and defect passivation at grain boundaries. Consequently, the non-radiative recombination loss is remarkably suppressed, achieving green PeLEDs with high efficiency, high brightness and high color purity. Furthermore, we proposed a facile route by adopting the light-extraction nanostructures to enhance the outcoupling efficiency of waveguided light and substrate mode in PeLEDs. As a result, the external quantum efficiency (EQE) and current efficiency of CsPbBr3 PeLEDs were improved to 28.2% and 88.7 cd/A, while retaining spectral and angular independence. These results represent a substantive step towards achieving practical applications of PeLEDs.