Pb-Based Metal-Organic Frameworks for Efficient Perovskites Light-emitting Diodes Applications

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Hybrid perovskites materials have demonstrated an extraordinary potential for clean, sustainable energy technologies and low-cost optoelectronic devices. In spite of the unprecedented progress in photovoltaics over the past decay, perovskites light-emitting diodes (PeLEDs) emergent as one of the most promising light emitters with performances exceeded 20% EQE efficient and low energy consumption devices. One of the key challenges that exists in the field today is the stability and reliability of devices under operation conditions. This vulnerability remains an open question, which might determine the fate of this remarkable material despite excellent properties.

A fundamental requirement for achieving highly efficient light emission and stability operation used in PeLEDs is to design molecular structures that facilitate recombination of the electrically or optically generated electron and hole pair to emit photons. Here, we demonstrate a new type Pb-based metal-organic frameworks (MOFs) perovskites as LED emitter with naturally formed quantum and dielectric confinement, where efficient radiative recombination is expected. We show that the Pb-based MOFs have a PeLEDs performance with over 5% EQE and extended charge localization due to the structure confinement and consequently improved the carrier transport and radiative recombination.

[1] Zhao et al, *Nat. Photonics*, **12**, 783–789 (2018).
[2] Xu et al, *Nat. Photonics*, **13**, 418–424 (2019)
[3] Tsai et al, *Adv.Mater.,* **30**, 1704217 (2018).

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