

High-performance organic light-emitting diodes with metal halide perovskite host and transport layers

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Typical organic light-emitting diodes (OLEDs) are composed of organic thin layers. In this study, we use metal halide perovskites as host and transport layers instead of organics for the fabrication of OLEDs. Perovskites based on a blend of organic and inorganic components can be processed from low-cost starting materials using the same fabrication processes as for organics, making perovskites and organics an excellent match. Additionally, unlike organics used in OLEDs, perovskites have high carrier mobilities because of metal halide frameworks formed through films. By taking these advantages, we demonstrated high performance from OLEDs, in which the emitting layers are organics that show efficient emission and the host and transport layers are perovskites that have high carrier mobilities [1,2]. Additionally, we obtained high external quantum efficiencies > 40% and power conversion efficiencies > 70 lm/W from the devices. These efficiencies surpassed the 2020 milestone values in the I²CNER's project roadmap. The figure below is an illustration regarding this sort of OLEDs. Based on this work, perovskites will be seen in a new light as versatile, high-performance materials for supporting roles in not only OLEDs but also other organic electronic devices, such as lasers, memory devices, and sensors.

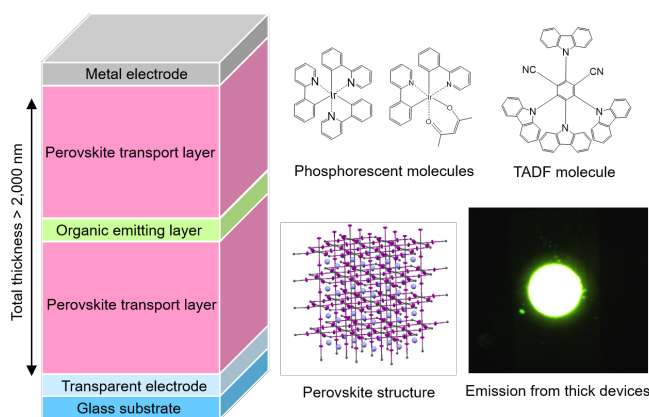


Fig. 1. OLEDs with perovskite transport layers.

[1] Matsushima et al., *Adv. Mater.* 30, 1802662, 2018.

[2] Matsushima et al., *Nature* 572, 502, 2019.