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Investigation of the Green Emission Profile in PHOLED by Gasket Doping

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PHOLED devices which have the structure of ITO/HAT-CN(5nm)/NPB(50nm)/EML(30nm)/TPBi(10nm)/Alq₃(20nm)/LiF(0.8nm)/Al(100nm) are fabricated to investigate the green emission profile in EML by using a gasket doping method.

CBP and Ir(ppy)₃ (2% wt) are co-deposited homogeneously as a background material of EML for green PHOLED, then a 5nm thickness of additionally doped layer by Ir(btp)₂ (8% wt) is formed as a profiler of the green emission.

The total thickness of the EML is maintained at 30nm while the distance of the profiler from the HTL/EML interface side (x) is changed in 5nm steps from 0nm to 25nm.

As shown in Fig. 1, the green (513nm) peak from Ir(ppy)₃ is not observed when Ir(btp)₂ is also doped homogeneously because Ir(ppy)₃ works as a gasket dopant of the Ir(btp)₂:CBP system.

Therefore, in this experiment, Ir(btp)₂ can be used as a profiler of the green emission in CBP:Ir(ppy)₃ system.

The emission spectra from the PHOLED devices with different x are shown in Fig. 2.

In this gasket doping system, stronger red peak means more energy transfer from green to red dopant or higher exciton density by green dopant.

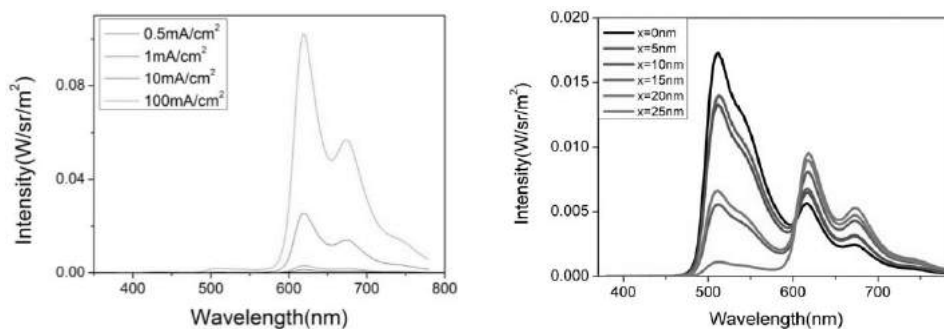
To find the green emission profile, the external quantum efficiency (EQE) at 3mA/cm² for red peaks are calculated.

More green light emission at near EML/HBL interface than that of HTL/EML is observed (insert of Fig. 2). This means that the higher exciton density at near EML/HBL interface in homogeneously doped CBP with Ir(ppy)₃.

As shown in Fig. 3, excitons can be quenched easily to HTL(NPB) because the T1 level of HTL(2.5eV) is relatively lower than that of EML(2.6eV).

On the other hand, the T1 level of HBL(2.7eV) is higher than that of EML.

Keywords: PHOLED, gasket doping, external quantum efficiency



□ Band diagram

