▶ BK-GF 공동 세미나 ◀

Blue phosphorescent organic light emitting diodes with a ten-fold improved operational lifetime

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■ Abstract

Development of long-lived blue phosphorescent organic light emitting devices (PHOLEDs) has long been a technological hurdle impeding the implementation of electrophosphorescence in full color displays and lighting. The challenge primarily stems from the intrinsic degradation mechanism of PHOLEDs; i.e. energetically driven triplet-polaron annihilation (TPA) creates highly excited, "hot" polaron states in the emissive layer (EML), which in blue PHOLEDs can briefly obtain energies > 6 eV. These hot polarons are likely to cleave weak chemical bonds of molecules via thermal dissipation, ultimately leading to a permanent loss in luminance. In this talk, we demonstrate a systematic approach to reduce TPA reactions, and thereby increase the operational lifetime of blue PHOLEDs by two strategies: modifying the conventional EML structure and stacking optically and electrically optimized devices that feature the modified EML design. As a result, we achieve a 10-fold improvement in lifetime of blue PHOLEDs compared with conventional devices, to T_{80}=616±10hrs(measured) and T_{50}=3,500hrs(extrapolated) at an initial luminance of L_0=1000cd/m^2. These devices with chromaticity coordinates of [0.15,0.29] also show an improved external quantum efficiency as high as18.0±0.2%. If operated at luminance levels required for mobile display applications, the blue PHOLED lifetime in this talk is comparable to that of commercial green PHOLEDs. Our results confirm that the mitigation of TPA is a key to extending PHOLED lifetime while maintaining high efficiency at high brightness.

■ Biography

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