

Efficiency enhancement of all solution processed quantum dot light emitting diode by Mg alloyed ZnO electron transport layer

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In this work, efficiency of all solution processed inverted structure QLED is enhanced by a magnesium alloyed zinc oxide(ZnMgO) ETL. Wurtzite crystal structure of ZnMgO NPs are maintained regardless of the amount of Mg contents. Conduction band of ZnMgO is up-shifted by increased Mg contents from 4.0 eV to 3.4 eV. Electron only devices are fabricated to determine electron transport of Mg alloyed ZnO NPs and electron current is drastically reduced by increased Mg contents. Up-shifted conduction band and less electron current in electron only devices imply less electron transport from an ETL to an EML and better charge balance of holes and electrons. Inverted structure QLEDs are fabricated by solution processed ZnMgO/QDs/PEIE/Poly-TPD/MoOx layers without any interlayer between an ETL and an EML. Luminance and efficiency of QLEDs are enhanced by increased Mg contents of ZnMgO ETLs. ZnMgO ETL with highest ZnMgO contents exhibited 1.8 times higher maximum luminance (43000 cd/m²) and 2 times higher current efficiency (73.8 cd/A) than bare ZnO ETL.