Mg-doped ZnO nanoparticles to control electron injection for solution-processed quantum dot-light emitting devices

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ZnO nanoparticles (NPs) are widely used for electron transport layer (ETL) of quantum dot (QD) light-emitting diodes (LEDs). Because of high electron conductivity and low electron injection barrier, excess electron injection induces charge imbalance in QD emitting layer. In this respect, we employ magnesium-doped ZnO NPs, $Zn_{1-X}Mg_XO$ (x = 0.05, 0.1, 0.15) NPs to reduce electron mobility and broaden band gap by increasing Mg doping ratio. The inverted structure QLEDs with $Zn_{0.9}Mg_{0.1}O$ ETL exhibits the maximum current efficiency of 6.57 cd/A and external quantum efficiency of 5.52%, exhibiting a 76% and 79% enhancement compared to the device with ZnO ETL, respectively.