

Efficiency Enhancement of Solution-Processed Inverted Quantum Dot Light-Emitting Diodes via Ligand Modification with 6-Mercaptohexanol

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The conventional hydrophobic oleic acid ligand can be damaged by hole transport layer (HTL) solvents such as chlorobenzene. [1] To prevent damage to the QD layer, Oleic acid ligand was partially substituted by hydrophilic 6-mercaptohexanol ligand via a ligand exchange process without losing any optical properties. The QD emitting layer (EML) maintained its integrity with the ligand exchange even after exposure to chlorobenzene, a typical HTL solvent, resulting in the efficiency enhancement of the all-solution-processed inverted QLEDs. Inverted QLEDs with a QD EML with OH-QDs performance was compared with that of inverted QLEDs with OA-QDs; the maximum current efficiency of the device with the OH-QDs considerably increased to 39.0 cd A⁻¹ from 5.3 cd A⁻¹, and simultaneously the peak external quantum efficiency increased to 9.3% from 1.2%. This work is expected to provide effective solutions for producing efficient all-solution-processed inverted QLEDs.

[1] K. Lee, C. Han, E. Jang, J. Jo, S. Hong, J. Hwang, E. Choi, J. Hwang and H. Yang, , "Full-color capable light-emitting diodes based on solution-processed quantum dot layer stacking", *Nanoscale*, 10, 6300 (2018)