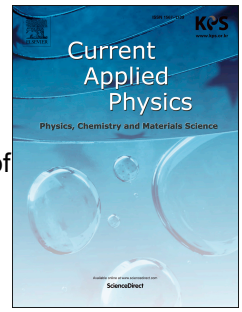
Accepted Manuscript



A solution-processable inorganic hole injection layer that improves the performance of quantum-dot light-emitting diodes

Sang Moo Lee, Dongguen Shin, Nam-Kwang Cho, Yeonjin Yi, Seong Jun Kang

PII: S1567-1739(16)30363-7

DOI: 10.1016/j.cap.2016.12.024

Reference: CAP 4415

To appear in: *Current Applied Physics*

Received Date: 2 November 2016

Revised Date: 12 December 2016

Accepted Date: 14 December 2016

Please cite this article as: S.M. Lee, D. Shin, N.-K. Cho, Y. Yi, S.J. Kang, A solution-processable inorganic hole injection layer that improves the performance of quantum-dot light-emitting diodes, *Current Applied Physics* (2017), doi: 10.1016/j.cap.2016.12.024.

A Solution-Processable Inorganic Hole Injection Layer that Improves the Performance of Quantum-Dot Light-Emitting Diodes

Sang Moo Lee[1], Dongguen Shin[2], Nam-Kwang Cho[3], Yeonjin Yi[2], and Seong Jun Kang[1,*]

[1] Department of Advanced Materials Engineering for Information and Electronics, Kyung Hee University, 1732 Deogyeong-daero, Giheung-gu, Yongin, Gyeonggi-do 446-701, Republic of Korea

[2] Institute of Physics and Applied Physics, Yonsei University, 50 Yonsei-ro, Seodaemun-gu, Seoul 120-749, Republic of Korea

[3] Program in Nano Science and Technology, Graduate School of Convergence Science and Technology, Seoul National University, Seoul 151-742, Republic of Korea

Abstract

Solution-processable vanadium oxide (V_2O_5) was used as an inorganic hole injection layer (HIL) to improve the performance and stability of quantum-dot light-emitting diodes (QLEDs). Non-acidic and non-hygroscopic V_2O_5 solution was synthesized and spin-coated onto indium-tin-oxide (ITO)/glass substrate to serve as an HIL for QLEDs. QLEDs with a V_2O_5 HIL showed efficient hole injection and had improved luminous efficiency and life-time. Maximum luminance and luminous efficiency of QLEDs fabricated under ambient conditions were 12,603 cd/m^2 and 2.96 Cd/A, respectively. Photoelectron spectroscopy measurements were conducted to construct an energy level diagram of the QLEDs, and we found that the gap states of V_2O_5 enabled efficient hole-injection from ITO into the devices through the V_2O_5 HIL, resulting in enhanced luminance. These results suggest that solution-processable V_2O_5 is a feasible alternative to organic HILs for high-performance QLEDs.