

Nanoparticle scattering film for high light extraction efficiency of flexible organic light emitting diodes

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In order to increase the light extraction efficiency of organic light emitting diodes (OLEDs), various internal/external additional layer has been studied so far [1-3]. Especially, for the practical application of OLED display/lighting system, the simple and cheap fabrication process is one of the key issue.

In this letter, we introduced a nanoparticle scattering film based on polymer-metal oxide composite as the light extraction method [4]. Simple blend of polymer-metal oxide composite was spin-coated on the flexible substrate with different experimental conditions and consequently measured the optical characteristics as well as the electrical properties. We found that the density and the distribution of nanoparticle is the key factor to maximize the light extraction efficiency of pristine OLEDs by out-coupling the unusable light with the scattering film. In our experiment, almost 80% of light extraction efficiency was obtained under the optimized conditions. Also it was successfully adopted to the flexible substrate without any additional treatment. This method is expected to play a critical role to create the low-power flexible OLED application with simple fabrication process and low cost.

Acknowledgment

This research was supported by Basic Science Research Program through the NRF-2012R1A1A1014888 and the NRF-2014R1A1A2053957

References

1. K. Saxena, V. K. Jain, and D. S. Mehta, *J. Optical Materials*, 1(32), 221 (2009).
2. H.-W. Chang, K.-C. Tien, M.-H. Hsu, Y.-H. Huang, M.-S. Lin, C.-H. Tasi, Y.-T. Tasi, and C.-C. Wu, *J. of SID*, 2(19), 196 (2011).
3. H.-W. Chang, J.-H. Lee, S. Hofmann, Y. H. Kim, L. Muller-Meskamp, B. Lussem, C.-C. Wu, K. Leo, and M. C. Gather, *J. Appl. Phys.*, 113(20), 204502 (2013).
4. C.-H. Shin, E. Y. Shin, M.-H. Kim, J.-H. Lee, and Y. Choi, *Opt. Express*, 23(3), A133 (2015).