Solid State Science and Technology, Vol. 15, No 2 (2007) 75-82
ISSN 0128-7389

REDUCTION OF TURN-ON VOLTAGE IN POLYMER ORGANIC LIGHT-EMITTING DIODE USING NANOPARTICLES TIO_2 THIN FILM AS A HOLE INJECTION LAYER

Tengku Hasnan Tengku Aziz[1], Muhamad Mat Salleh[1] and Muhammad Yahaya[2]

[1] *Institute of Microengineering and Nanoelectronics (IMEN)*

[2] *School of Applied Physics, Faculty of Science & Technology, Universiti Kebangsan Malaysia, 43600 Bangi, Selangor, Malaysia*

ABSTRACT

A low turn-on voltage of polymer light-emitting diode, PLED is important for economical display application. We had fabricated the nanoparticlesTiO_2 thin film between ITO and PDPV in Al/PDPV/ITO structure as a hole injection layer. The sol gel method synthesized of TiO_2 thin film was deposited using spin coating technique. It was found that TiO_2 has reduced the turn-on voltage of the original PLED device from 8.0 V to 5.0 V.

http://journal.masshp.net/wp-content/uploads/Journal/2007/Jilid%202/Tengku%20Hasnan%20Tengku%20Aziz%2075-82.pdf

REFERENCES

[1] Furong Zhu, Huan, C.H.A., Keran Zhang and Wee, A.T.S. (2000); Investigation of annealing effects on indium tin oxide thin films by electron energy loss spectroscopy, Thin Solid Films, Vol. 359, pp. 244-250.

[2] Li, C.N., Kwong, C.Y., Djurisic, A.B., Lai, P.T., Chui, P.C., Chan, W.K., Liu, S.Y. (2005): Improved perfomances of OLEDs with ITO surface treatments, Thin Solids Film, Vol. 477, pp. 57-62.

[3] Buwen, X., Yafeng, S., Meng, M. and Chuannan, L. (2005): Enhancement of hole injection with an ultra-thin Ag2O modified anode in organic light-emitting diodes, Microelectronics Journal, Vol. 36, No. 2, pp.105-108

[4] Shengwei Shi and Dongge Ma, (2005); A pentacene-doped hole injection layer for organic light-emitting diodes, Semiconductor Science and Technology, Vol. 20, pp. 1213-1216.

[5] Yang, Y., Westerweele, E., Zhang, C., Smith, P. and Heeger, A.J. (1995); Enhanced perfomance of polymer light-emitting diodes using high-surface area polyaniline network electrodes, Journal of Applied Physics, Vol. 77, pp. 694-698.

[6] Chengfeng Qiu, Haiying Chen, Zhiliang Xie, Man Wong and Hoi Sing Kong, (2002); Praseodymium oxide coated anode for organic light-emitting diode", Applied Physics Letters, Vol. 80, pp. 3485-3487.

[7] Parker, I.D. (1994); Carrier tunneling and device characteristics in polymer light-emitting diodes. Journal Of Applied Pysics, 75, pp.1656-1666.

[8] Ding, X.M. (2000); Modification of the hole injection barrier in organic light–emitting devices studied by ultraviolet photo electron spectroscopy, Appiled Physics Letters, Vol. 76, pp. 2704-2706.

[9] Yudi Gao, Liduo Wang, Deqiang Zhang, Lian Duan, Guifang Dong & Yong Qiu. (2003); Bright single-active layer small-molecule organic light-emitting diodes with a polytetrafluoroethylene barrier. Applied Physics Letters 82, pp. 155-157.
[10] Deng, Z.B. and Ding, X.M. Enhanced brightness and efficiency in organic electroluminescent devices using SiO2 buffer layer", Applied Physics Letters, Vol. 74, pp. 2227-2229.
[11] Huang, Z.H., Zeng, X.T., Kang, E.T., Fuh, Y.Y. and Lu, L. (2005); Ultrathin sol-gel titanium oxide hole injection layer in OLEDs, *Surface & Coating Technology*, Vol. **198**, pp. 357-361.
[12] Deng, Z.B., Ding, X.M., Liao, L.S., Hou, X.Y. and Lee, S.T. (2000); The interface analyses of inorganic layer for organic electroluminescent devices, *Displays*, Vol. **21**, pp. 79-82.
[13] Tadayyon, S.M., Grandin, H.M., Griffiths, K., Norton, P.R., Aziz, H. and Popovic, Z.D. (2004); CuPc buffer layer role in PLED performance: a study of the interfacial band energies, *Organic Electronics*, Vol. **5**, No. 4, pp. 157-166.
[14] Furong Zhu, Beeling Low, Keran Zhang and Soojin Chua, (2001); Lithium-fluoride-modified indium tin oxide for enhanced carrier injection in phenyl-substituted polymer electroluminescent devices, Appl. Phys. Lett. **79(8)**, pp. 1205-1207.
[15] Zhang Zhi Feng, Deng Zhen-Bo, Liang Chun-Jun, (2003); Organic light-emitting diodes with a nanostructured TiO_2 layer at the interface between ITO and NPB layers, *Displays,* Vol. **24**, No. 4-5, pp. 231-234.