Supplementary Material (ESI) for Journal of Materials Chemistry

High-Efficiency Blue Organic Light-Emitting Diode Using a 3,5-di(9H-carbazol-9-yl)tetraphenylsilane Host via Solution-Process

Supporting Information

Device lifetime: To investigate the lifetime performance of the three studied materials, simple encapsulation has been done on the corresponding blue devices. The lifetime is 26±2 hrs for the SimCP2 containing device, while 22±1 and 17±1 hrs for the SimCP and mCP-containing counterparts. The reasons why the SimCP2 containing device has exhibited a longer lifetime may be attributed to its better robustness due to its higher glass transition temperature and its higher current efficiency.[1]

Effect of fabrication process on the roughness of the mCP-composing film: **Fig. S1** shows the atomic-force microscopic (AFM) images of the surface topology of the mCP-composing film via solution-process upon drying at 70 ˚C (>T_g, 55˚C), comparing with the one at 45 ˚C (<T_g). As seen, the resultant surface upon drying at 70 ˚C is rough, with surface roughness of 5.7 nm, while the counterpart upon drying at 45 ˚C is relatively smooth, with surface roughness of 0.6 nm. This indicates that the resultant film is easy to deform, causing spikes on its surface, as the applied drying-temperature (70 ˚C) is higher than the T_g of mCP (55 ˚C).[2] Therefore, the rough morphology of the emissive layer would cause serious leakage current, and in

turn damage the device efficiency. However, using a relatively low temperature, for example, 45 ˚C, in the drying process is not suitable for the device fabrication, since the applied temperature is much lower than the boiling point of solvent (110 ˚C), which will in turn make the residual solvent difficult to evaporate. Hence, no efficiency result of the mCP-composing device via solution-process upon drying at 45 ˚C is shown in this report.

Fig. S1 also shows the AFM image of the surface topology of the mCP-composing film via dry-process. As seen, the resultant surface via solution-process upon drying at 70 ˚C is rougher than that via dry-process. The rough morphology of the solution-processed mCP film may explain why its resulting device exhibited a comparatively low efficiency if fabricated via wet-process.

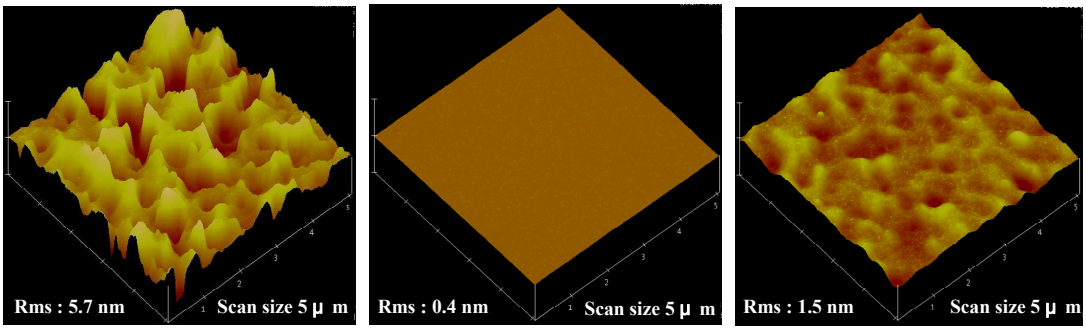

Fig. S1 Atomic-force microscopic (AFM) images of the surface topology of the mCP-composing films upon drying at 70 ˚C after the solution-process, comparing with that upon drying at 45 ˚C. Also shown is the dry-processed counterpart. All the films are prepared on the PEDOT: PSS-coated ITO-substrate.

Reference

(1) (a) C. H. Yang, Y. M. Cheng, Y. Chi, C. J. Hsu, F. C. Fang, K. T. Wong, P. T. Chou, C. H. Chang, M. H. Tsai and C. C. Wu, *Angew. Chem. Int. Ed.*, 2007, **46**, 2418; (b) F. Steuber, J. Staudigel, M. Stossel, J. Simmerer, A. Winnacker, H. Spreitzer, F. Weissortel and J. Salbeck, *Adv. Mater.*, 2000, **12**, 130; (c) J. H. Jou, C. C. Chen, Y. C. Chung, M. F. Hsu, C. H. Wu, S. M. Shen, M. H. Wu, W. B. Wang, Y. C. Tsai, C. P. Wang and J. J. Shyue, *Adv. Funct. Mater.*, 2008, **18**, 121.

(2) M. C. Sun, J. H. Jou, W. K. Weng and Y. S. Huang, *Thin Solid Films*, 2005, **491**, 260.