Carbon nanotube transparent conducting films as electrodes for organic light-emitting diodes

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Purified single-walled carbon nanotubes (SWCNTs) were dispersed in water using sodium dodecyl benzene sulfonate (SDBS) as dispersant for SWCNT transparent conducting films (TCFs). The optimal ratio of SWCNT/SDBS was found according to the film resistance of before and after post-treatment by nitric acid [1]. The TCFs were then further treated with thionyl chloride to improve their conductivity. Low sheet resistance and the high transmittance TCFs were achieved [2]. The TCFs were selected for electrodes of organic light-emitting diodes (OLEDs). The as prepared SWCNT-TCFs displayed a rather large surface roughness of 30 nm. The TCFs was top-coated with poly (3, 4-ethylenedioxythiophene): poly (styrene sulfonate) (PEDOT:PSS) to achieve PEDOT:PSS coated TCFs and the surface roughness decreased to 12 nm. The SWCNT-TCFs mixed with PEDOT:PSS (PM-TCFs) achieving high conductivity, low surface roughness (3 nm). Flexible OLEDs were fabricated on TCFs with the same structure using 4,4’-bis(2,2’-diphenylvinyl)-1,1’-biphenyl as emitting layer to evaluate the performance of different types of SWCNT films for OLEDs. Among these types of OLEDs, the PM-TCF devices showed the optimal performance with high luminance and current efficiency. The result was explored in details to further explore the mechanism involved for better applying SWCNT films to OLED devices [3].