The Study of Encapsulation Process in Organic Light Emitting Diode

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ABSTRACT

In this thesis, the 4,4',4''-Tris(N-3-methylphenyl-N-phenyl-amino)triphenylamine (m-MTDATA) and the lithium fluoride (LiF) films were deposited on OLEDs as the cathode protective layers. After the device encapsulation, the I-V characteristics, the contact angles of water droplet and the half-life of OLED were measured and discussed in detail. Since the lithium fluoride and the m-MTDATA films have low melting point and nearly insulating characteristics. Therefore, it is an advantage that the low temperature encapsulation process was performed on the OLED passivation to avoid reducing the emission efficiency and device lifetime. It was found that by adopting the lithium fluoride film as the passivation layer, the lifetime has a significant increase. With a 80nm-thick LiF, the passivated OLED shows a double lifetime compared to that of without passivated one. However, we also found that on top of the LiF film, the contact angle of water droplet was obviously reduced and the top surface shows highly hydrophilic. With the m-MTDATA cathode protective layer, the passivated OLED showed a fivefold increase in operational lifetime (~29h) compared to that of without the passivation. Due to the fact that the contact angle of water droplet on the membrane surface is obviously enhanced and appears highly hydrophobic, the device life time is thus enlarged. If the m-MTDATA film encapsulation process was applied on the flexible organic light emitting diode (FOLED). In addition, the FOLED was sealed with UV paste by using the PET plastics in an environment filled with nitrogen. The passivated device showed a 6.5 times increase in lifetime (~29.5 h) compared to that of without the passivation.

Keywords : lithium fluoride ; m-MTDATA ; Passivation ; OLED

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