Highly Transparent and Efficient Electron Injection Cathode Structure for Transparent Organic Light Emitting Diodes

Gyeong Woo Kim, Raju Lampande, Yong Cheol Kim, and Jang Hyuk Kwon
Dept. of Inform. Display, Kyung Hee University, Hoegi-dong, dongdaemoon-gu, seoul 130-701, Republic of Korea
Tel.:82-2-961-0948, E-mail: jhkwon@khu.ac.kr

Nowadays, transparent organic light emitting diode (TOLED) technology is recognized to be applied to a next-generation display due to its feasibility for the application of transparent display and smart window display. The most important component deciding high transparency is the transparent cathode structure in TOLEDs. Several approaches for the transparent cathode have been reported [1-3]. Among them, transparent cathode based on the ultra-thin metal layer is the most practical and easiest mathod. The majority of reported transparent cathode used Ag as the ultra-thin metal layer because Ag is the best material to get high transmittance and low sheet resistance due to thier low refractive index and resistivity. On the other hand, low reactivity of evaporated Ag atom limits electron injection property in the transparent cathode structure [4]. In our previous study, we reported efficient electron injection material of Li_2CO_3 for Ag based transparent cathode, which showed excellent electrical and optical properties [5]. However, when we changed the electron transport layer (ETL) from Bphen **(**4,7-diphenyl-1,10-phenanthroline**)** to TmPyPB (3,3'-[5'-[3-(3-pyridinyl)phenyl][1,1':3',1''-terphenyl]-3,3''-diyl]bispyridine) the electron injection was significantly reduced as shown in Figure 1 (left).

In this paper, we report high transmittance and good electron-injecting cathode systems by introducing alkali or alkaline earth metal instead of Li_2CO_3. Ba, Sr and Li are investigated as the EIL and among them Li shows the best electron-injecting property witout ETL dependency as shown in Figure 1 (right). This excellent electrical property is attributed to effective doping property of Li atom in TmPyPB.

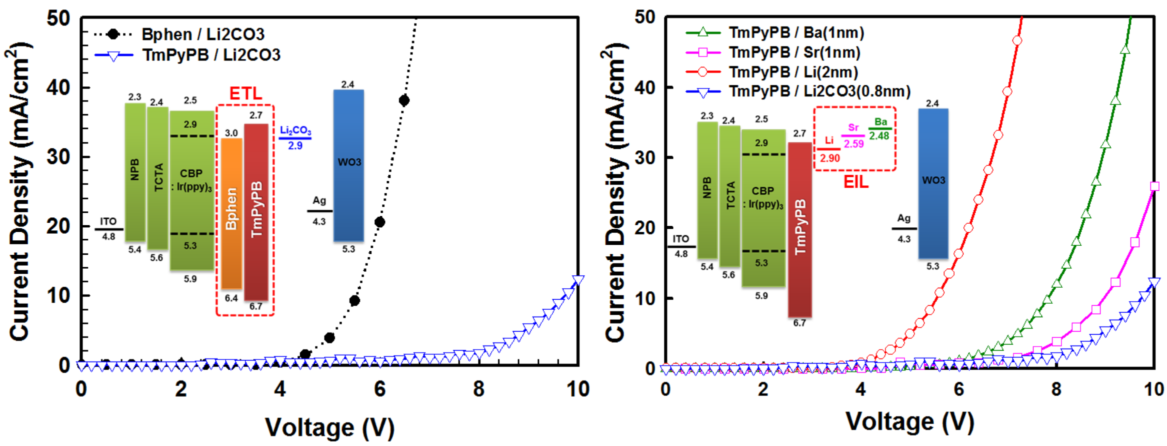

Fig. 1. J-V curves of TOLED using Li_2CO_3 as EIL with different ETL (Bphen or TmPyPB) (left) and using TmPyPB as ETL with different EIL (Ba, Sr, Li or Li_2CO_3) (right).

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