

High Contrast Ratio Transparent AMOLED

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Devices functioning light shutters have been investigated for interesting applications such as office screen window, car sun block sheet, smart window display, and etc. Among such applications, smart window display is very attractive as multiple purpose devices.¹⁾ A device with nematic liquid crystal can function as a light shutter. However, two of linear polarizers decrease the maximum transmittance by 50%. A device with polymer dispersed liquid crystals can realize high transparent performance when it becomes in transparent mode. However, the principle of light blocking of PDLC is light scattering.²⁾ Hence, it is difficult to have black color when it becomes in light blocking mode. Conductive polymers and tungsten trioxide (WO₃) have been extensively investigated for electrochromic devices (ECDs) in order to be applied to smart windows display.³⁻⁴⁾ However, there are serious problems such as slow response time and low optical density.⁵⁾

Here we report high contrast ratio smart window OLED devices made by combining transparent OLEDs and a new black screen ECDs. Our fabricated ECD has over 1.7 optical density at 600 nm, the fastest response time of 1.4 sec, less than 2 V driving voltage, and more than 1000 cycle lifetime of driving. The ECD with a transparent OLED panel exhibits a transmittance of 62.9 % at 550 nm. The transmittance of transparent OLED panel is 68.5% at 550 nm.

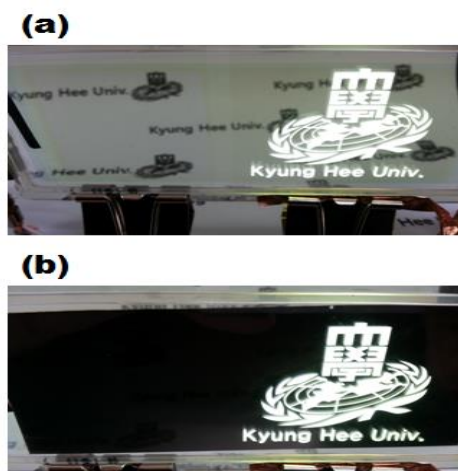


Figure 1. Operation of OLED and ECD device
(a): only transparent OLED is on, (b) both ECD and transparent OLED are on

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