Display Panel for AMOLED with 64 x 64 Pixels on 2" Plastic Substrate

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Abstract

In this paper we fabricated and succeeded to demonstrate a test panel for AMOLED on 2" glass and PET substrate. The test panel consisted of an array of 64 x 64 pixels in which OLEDs was driven by pentacene TFT. OTFTs were made of the inverted staggered structure and employed polyvinylphenol as the gate insulator and pentacene thin film as the active layer, producing the filed effect mobility of 0.3cm^2/V.sec and on/off current ratio of 10^5. OLEDs were composed of TPD for HTL and Alq3 for EML with 35nm thick each, generating green monochrome light.

1. Introduction

The technology of organic LEDs is well developed to be applied to the display panel of cellular phone in the passive mode. AMOLEDs are under development by the various companies; Philips, DuPont, IGNIS, SONY,
Honeywell, and PARC. The most companies use a-Si TFT as a driving device, except Philips and PARC adapting polymer TFT.
In this paper we fabricated a test panel for AMOLED which consisted of 64 x 64 pixels on glass and PET substrate. Each pixel was composed of one OLED and one pentacene TFT. We investigated the current driving capability of pentacene TFT for OLED and successfully demonstrated to display several standing patterns.

2. Pentacene TFTs

Pentacene TFTs adapted the inverted staggered structure as shown in Fig.1. Pentacene was deposited by OMBD at 190°C for 150min. To enhance the flexibility of PET substrate polyvynylphenol(PVP) was employed for the gate insulator. The optimum performance was obtained with 10wt% of PVP mixed by 5wt% of poly(melamine-co-formaldehyde), providing the field effect mobility of 0.32 cm^2/V.sec and on/off current ratio of 10^6. ITO on substrate was used for gate electrode. The transfer curve and the output characteristics are found in Fig.2.

3. Organic LEDs

OLEDs consisted of TPD for HTL and Alq3 for EML with 35nm thickness and generated green monochrome light at 530nm wavelength as shown in Fig.3. ITO was used for cathode and Al for anode electrode. As shown in I-V-L characteristics of Fig.4, OLEDs provided 1.93μA/mm^2 at 5V and 0.3cd/m^2 at 5V.

4. Test panel for AMOLED

The test panel consisted of 64 x 64 pixels on 2" glass and PET substrate. Each pixel has one OLED driven by one pentacene TFT in 500μm x 500μm area. TFT has the channel length of 70μm and width of 500μm. The area of OLED was 300μm x 500μm.

Since OTFT is more stable than OLED, OTFTs have been fabricated prior to OLEDs. The structure of pixel and its equivalent circuit is shown in Fig.1. The logo of Dong-A university has been displayed in the test panel as shown in Fig.5.

5. Conclusion

We fabricated the test panel for AMOLED on 2" glass and PET substrate which consisted of 64 x 64 pixels. Each pixel had one OLED driven by pentacene TFT in the area of 500μm x 500μm. We also successfully demonstrated to display the logo of Dong-A university on the panel.

Acknowledgment

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6. References

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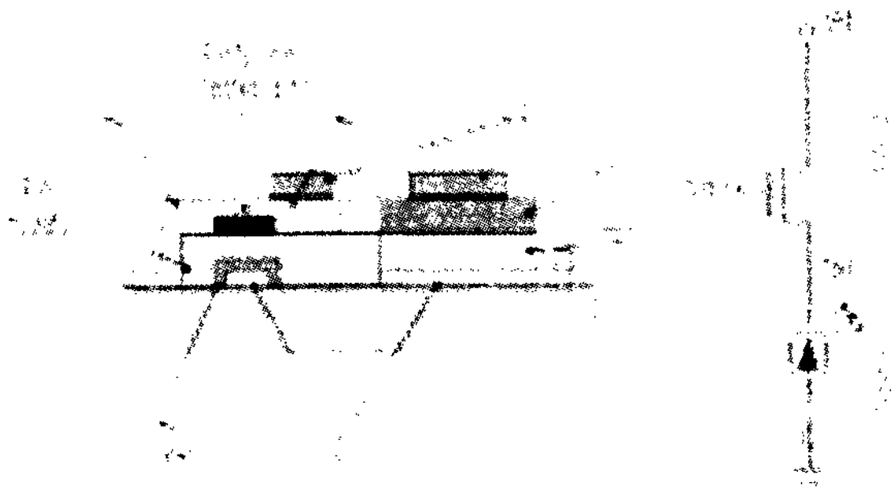
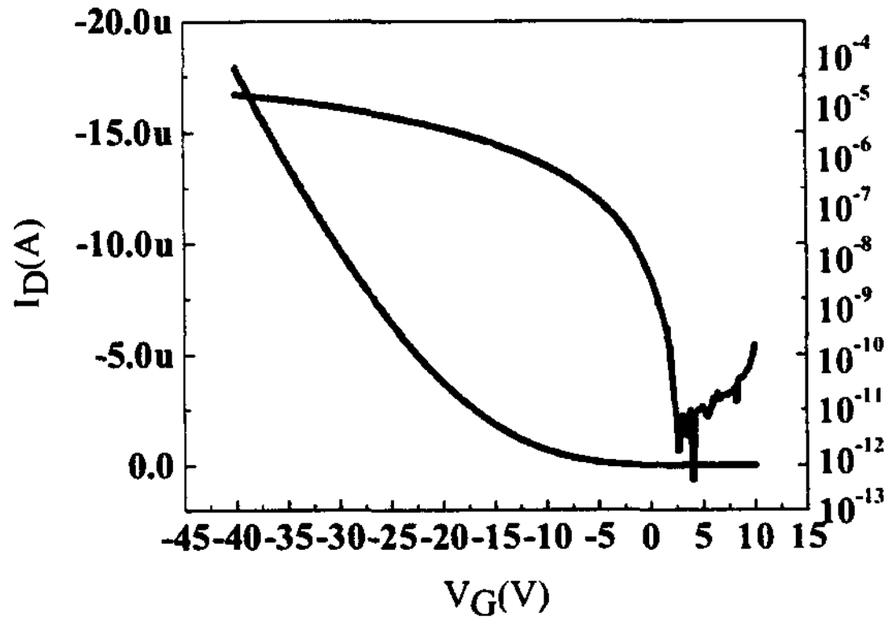


Fig. 1. The structure of a pixel consisted of OLED and OTFT and its equivalent circuit.



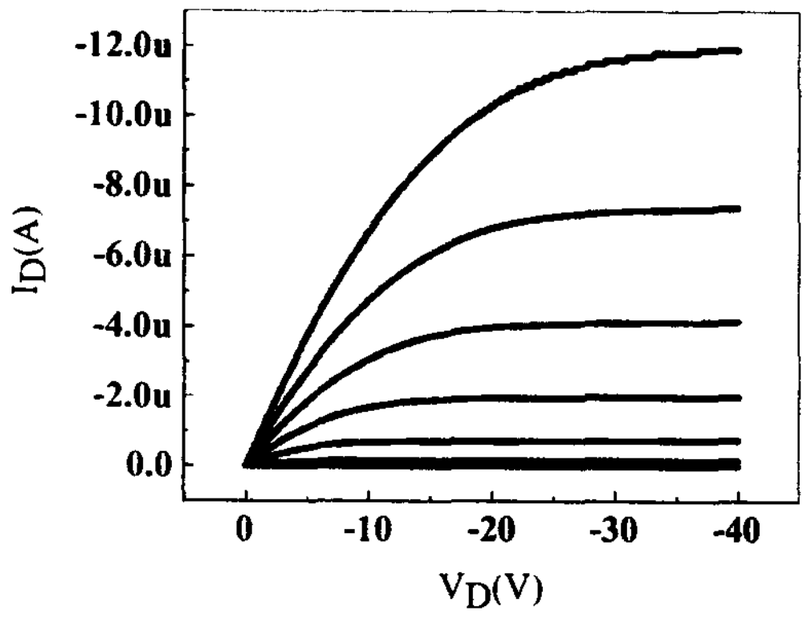


Fig. 2. The transfer and output characteristics of pentacene TFT using PVP gate.

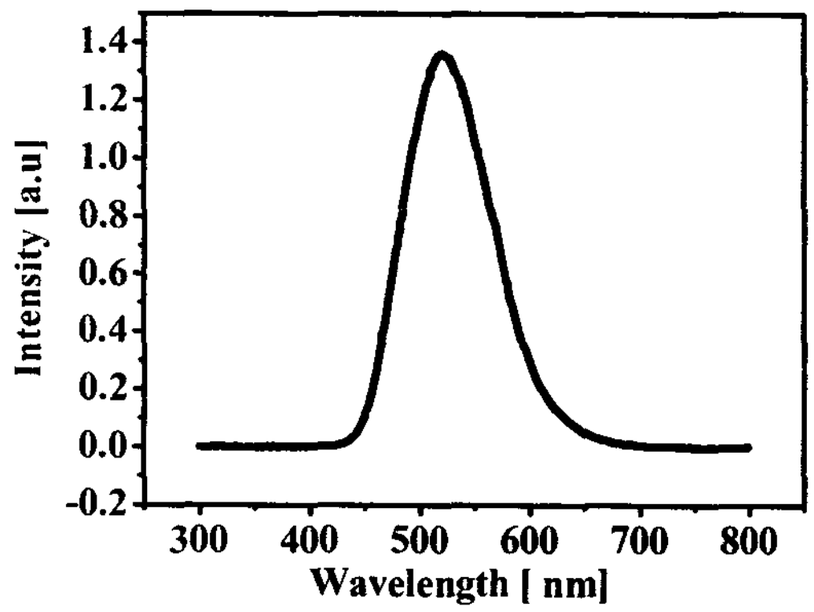


Fig. 3. The spectrum of light illuminated by OLED.

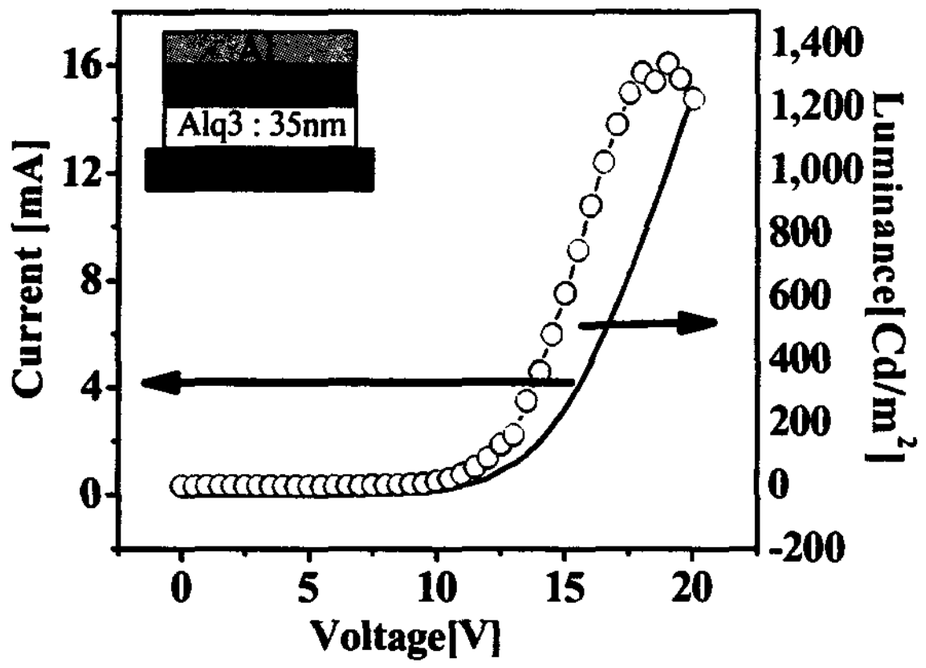


Fig. 4. I-V-L characteristics of OLED.

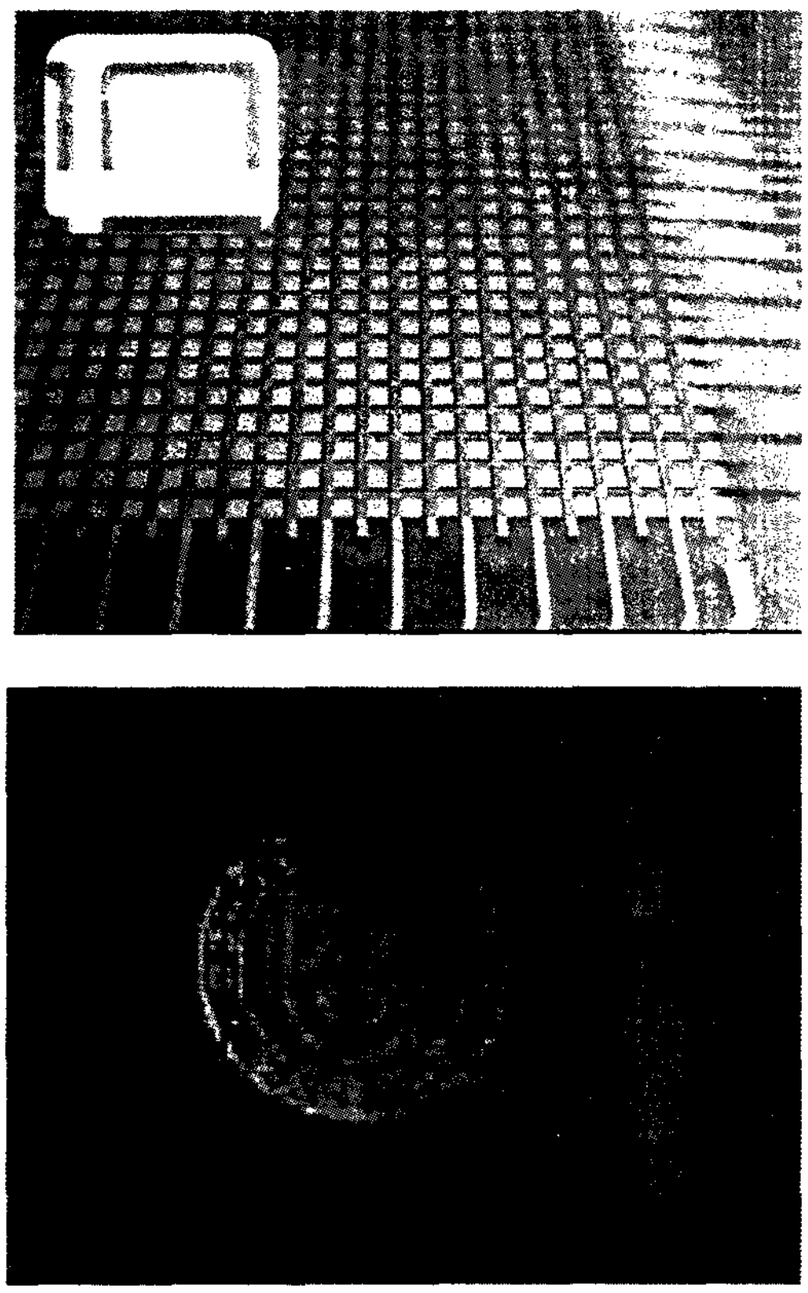


Fig. 5. Logo of Dong-A university displayed on the 2" panel.