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PANEL AND METHOD OF MAKING THE
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(2013.01); **H01L 51/5271** (2013.01)(71) Applicant: **WUHAN CHINA STAR
OPTOELECTRONICS
SEMICONDUCTOR DISPLAY
TECHNOLOGY CO., LTD.**, Wuhan,
Hubei (CN)(72) Inventor: **Wei YU**, Wuhan, Hubei (CN)(73) Assignee: **WUHAN CHINA STAR
OPTOELECTRONICS
SEMICONDUCTOR DISPLAY
TECHNOLOGY CO., LTD.**, Wuhan,
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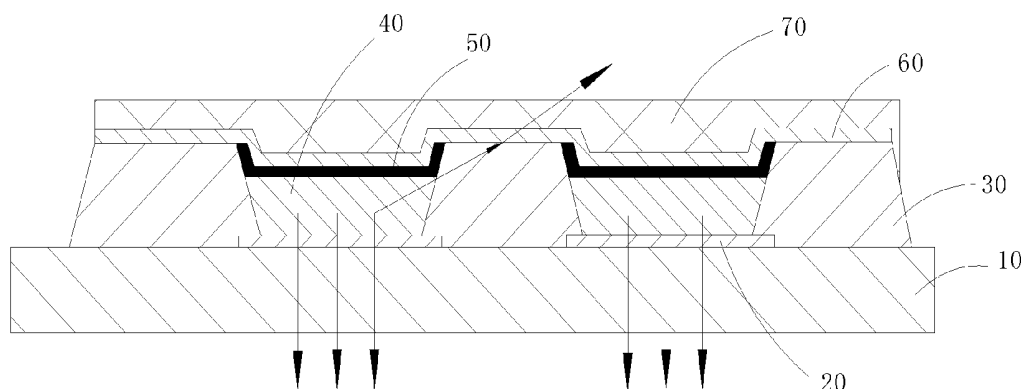
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(57) **ABSTRACT**

An organic light emitting display panel is provided, includes a substrate, a transparent anode, a pixel definition layer, an organic light emitting layer and a plurality of cathodes having reflective function provided on the substrate. A plurality of open slots is provided on the pixel definition layer. The anodes are provided on one end of the open slot adjacent to the substrate, the organic light emitting layer is packed in the open slot, the cathodes are provided on another side of the open slot away from the substrate. A method of manufacturing an organic light emitting display panel is also provided. The reflective cathode is made only in light emitting region, can prevent sub-pixels from light interference emitted from adjacent sub-pixels as well as increase color purity and improve color shift phenomenon in a bottom emission type device.



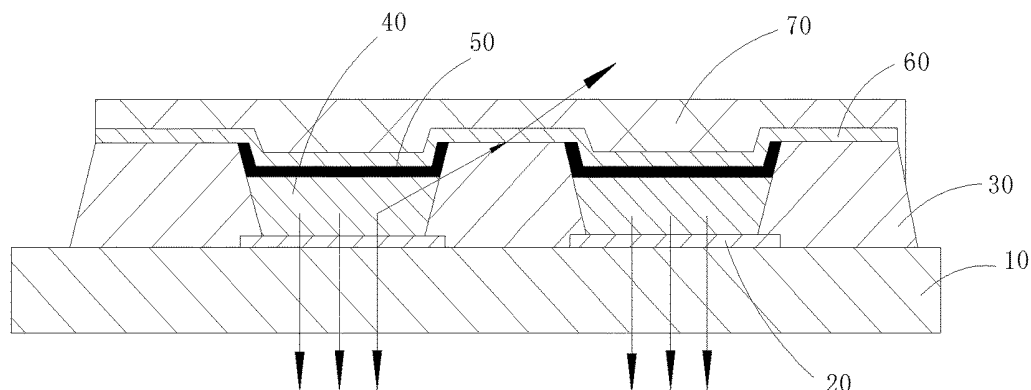


FIG. 1

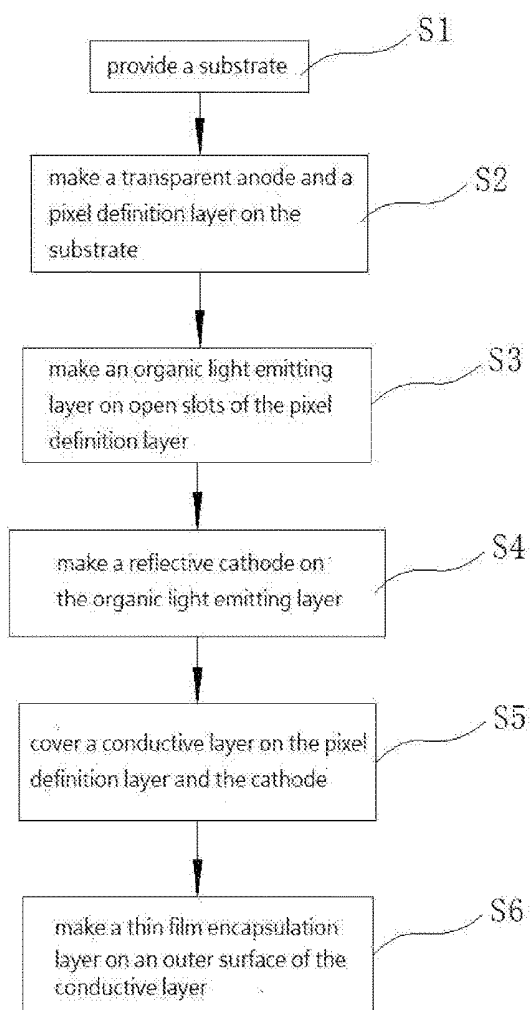


FIG. 2

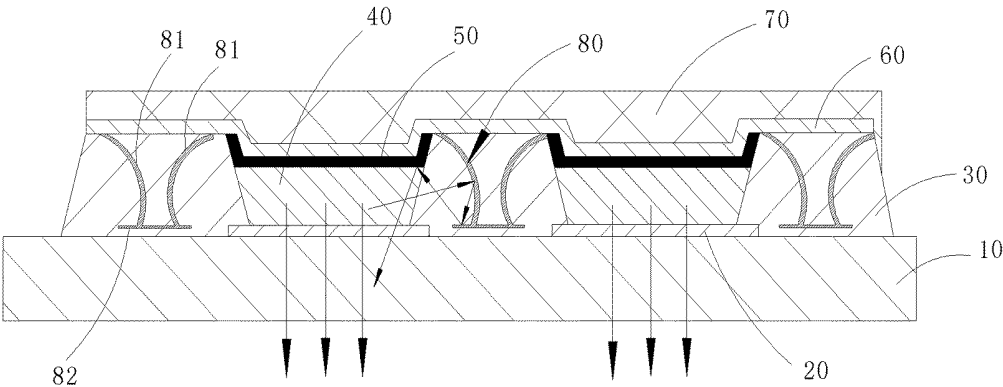


FIG. 3

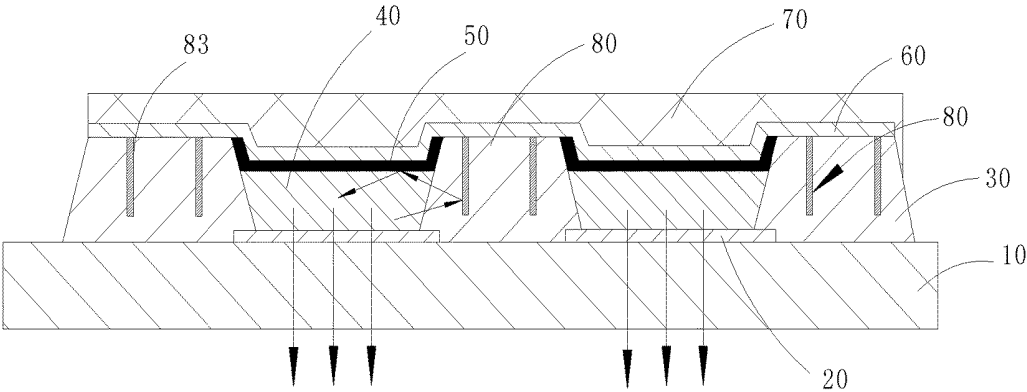


FIG. 4

ORGANIC LIGHT EMITTING DISPLAY PANEL AND METHOD OF MAKING THE SAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present disclosure relates to a field of an organic light emitting display technique. In particular, it includes the organic light emitting display panel and a method of making the same.

2. The Related Arts

[0002] Organic Light Emitting Diode (OLED) display is a new generation display, through making an organic thin film on the OLED substrate, and arranging the organic thin film between cathode metal and anode metal or the conductive layer, as well as applying the voltage to both electrodes, the organic thin film will light. OLED monitor has a plurality of advantages than a liquid crystal display such as self-luminous, fast response, wide viewing angle, saturated color and so on.

[0003] OLED device is divided into top emission type device and bottom emission type device. In the bottom emission type device, the anode generally adopts a transparent conductive layer such as indium tin oxide (ITO), and the cathode generally adopts a metal with high reflectivity such as aluminum, magnesium and silver. In addition, the light emitted from the organic material emits in all directions, some of which injects directly from the anode and some of which reflects through the cathode and injects from the anode, and ultimately received by the human eye.

[0004] However, since to the screen resolution is getting higher and higher currently, as well as more and more dense arrangement between pixels. In the emission type device, a part of the light emitted from the organic material of a sub-pixel emits from the adjacent sub-pixels through the reflection of the cathode in non-emitting region, resulting in the decrease of color purity and color shift phenomenon, thereby affecting the display effect.

SUMMARY

[0005] Owing to the deficiencies of the prior arts, the present disclosure provides an organic light emitting display panel and a method of making the same, which can prevent sub-pixels from light interference emitted from adjacent sub-pixels as well as increase color purity and improve color shift phenomenon of bottom emission type device.

[0006] To achieve the above objectives, the present disclosure adopts the following technical solutions:

[0007] An organic light emitting display panel comprises a substrate, an anode provided on the substrate, a pixel definition layer, an organic light emitting layer, and a cathode having reflective function, wherein a plurality of open slots are provided on the pixel definition layer, one end of the open slot adjacent to the substrate is disposed on the anode, the organic light emitting layer is packed in the open slot, the cathode is disposed on the organic light emitting layer and being contained in the open slot.

[0008] As one of the embodiments, the organic light emitting panel further comprises a conductive layer, the

conductive layer is disposed above the pixel definition layer and the cathode, and full covers the pixel definition layer and the cathode.

[0009] As one of the embodiments, the conductive layer is mesh-shaped connected to all the anodes, or the conductive layer is flake-shaped full covering the pixel definition layer and the cathode.

[0010] As one of the embodiments, the panel comprises a thin film encapsulation layer, the thin film encapsulation layer covers an outer surface of the conductive layer.

[0011] As one of the embodiments, the panel further comprises a reflector, the reflector is provided in the pixel definition layer and being used to reflect an incident light toward adjacent organic light emitting layer.

[0012] As one of the embodiments, the reflector comprises a first reflective part having a concave curved reflective surface, the first reflective part is a rotating body.

[0013] As one of the embodiments, the reflector further comprises a second reflective part covering one end of the first reflective part, edges of the second reflective part are peripherally extended from the end of the first reflective part.

[0014] As one of the embodiments, the reflector comprises a cylindrical reflective ring disposed vertically to the substrate.

[0015] Another objective of the present disclosure is to provide a method of manufacturing the organic light emitting display panel, comprising: providing a substrate, making an anode, a pixel definition layer, an organic light emitting layer, and a cathode having reflective function on the substrate. Wherein the cathode covers only on the organic light emitting layer.

[0016] In the organic light emitting panel of the present disclosure, the cathode having reflective function is only made in light emitting region, and the cathode having the reflective function is not made in non-emitting region. That can prevent sub-pixels from light interference emitted from adjacent sub-pixels as well as increase color purity and improve color shift phenomenon of emission type device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] FIG. 1 is a schematic diagram of a stacked structure of an organic light emitting panel according to embodiment 1 of the present disclosure;

[0018] FIG. 2 is a flow chart of making an organic light emitting display panel according to embodiment 1 of the present disclosure;

[0019] FIG. 3 is a schematic diagram of a stacked structure of an organic light emitting panel according to embodiment 2 of the present disclosure;

[0020] FIG. 4 is a schematic diagram of a stacked structure of an organic light emitting panel according to embodiment 3 of the present disclosure.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] To clarify the objectives, technical solutions and advantages, the present disclosure is further described in detail below with accompanying figures and embodiments. It should be understood that the specific embodiments described herein are merely employed for explaining and understanding the present invention, but are not limitations thereto.

[0022] The organic light emitting display panel of the present disclosure is a bottom emission type panel, which comprises a substrate and an anode provided on the substrate, a pixel definition layer, an organic light emitting layer, a cathode, and a plurality of open slots provided on the pixel definition layer. One end of the open slot adjacent to the substrate is provided on the anode, the organic light emitting layer is packed in the open slot, the cathode is provided on the organic light emitting layer and being contained in the open slot. The substrate, the anode, the pixel definition layer, and the organic light emitting layer are made of transparent material, the cathode and the anode correspond with each other and made by as adopting the material having reflective function such as aluminum, magnesium and silver with high reflectivity. When the anode and the cathode are energized, the organic light emitting layer emits light, the light is emitted from a side of the substrate after being reflected by the cathode. In the present disclosure, the open slots of the pixel definition layer are light emitting region of the OLED device, other regions are non-emitting region. Because of the cathode with reflective function is only made in the light emitting region and is not made in the non-emitting region, the light of the OLED device which is supposed to be emitted to the cathode in the non-emitting region will directly transmit and being absorbed by the adjacent structures instead of being reflected to the adjacent sub-pixels. Therefore, it can increase the color purity of the display panel and improve the color shift phenomenon. The present disclosure is further described below in combination with several specific embodiments.

Embodiments 1

[0023] Referring to FIG. 1, the bottom emission type organic light emitting display panel of the present embodiment comprises a substrate 10, an anode 20 provided on the substrate 10, a pixel definition layer 30, an organic light emitting layer 40, and a cathode 50 having reflective function. Wherein a plurality of open slots are provided on the pixel definition layer 30, one end of the open slot adjacent to the substrate 10 is disposed on the anode 20, the organic light emitting layer 40 is packed in the open slot, the cathode 50 is disposed on the organic light emitting layer 40 and being contained in the open slot away from the substrate 10, two ends of the open slot are respectively corresponding to an anode 20 and a cathode 50.

[0024] In order to make all the cathodes 50 electrically connect with each other to facilitate the transmission of electrical signals, in the present embodiment, a conductive layer 60 is further disposed on the surface of the cathode 50. The conductive layer 60 is disposed above the pixel definition layer 30 and the cathodes 50, and full covers with the pixel definition layer 30 and the cathode 50, the conductive layer 60 can be flake-shaped that fully covering the pixel definition layer 30 and cathodes 50. In other embodiment, the conductive layer 60 can also be mesh-shaped, the conductive layer 60 is hollowed in a region corresponding to the pixel definition layer 30 and only contacts and electrically connects with all the cathodes 50 at the same time. The manufacturing process of the flake-shaped conductive layer 60 is simpler, the manufacturing cost is lower, and the conductive reliability is better.

[0025] In addition, in order to ensure the service life, waterproof and dustproof performance of the organic light emitting display panel, the surface of the panel may further

comprise a thin film encapsulation layer 70 fully covers an outer surface of the conductive layer 60. The thin film encapsulation layer 70 can be a thin film encapsulation material, or a glass cover.

[0026] The present disclosure still provides a method of manufacturing a bottom emission type organic light emitting display panel, it mainly comprises providing a substrate 10, making a transparent anode 20, a pixel definition layer 30, an organic light emitting layer 40, and a cathode 50 having reflective function on the substrate 10. It should be noted that the cathode 50 covers only on the organic light emitting layer 40 (that is the pixel region).

[0027] Specifically, as shown in FIG. 2, the method of manufacturing the bottom emission type organic light emitting display panel of the present embodiment includes:

[0028] S1, providing the substrate 10;

[0029] S2, making the transparent anode 20 and the pixel definition layer 30;

[0030] S3, providing the organic light emitting layer 40 in the open slots of the pixel definition layer 30;

[0031] S4, making the cathode 50 having reflective function on the organic light emitting layer 40;

[0032] S5, covering the conductive layer 60 on the cathode 50 and the pixel definition layer 30;

[0033] S6, making the thin film encapsulation layer 70 on an outer surface of the conductive layer 60.

[0034] Because the cathode 50 covers only on the organic light emitting layer 40 (that is the pixel region) and does not extend to non-emitting region, the light of the OLED device which is supposed to be emitted to the cathode in the non-emitting region will directly transmit and being absorbed by the adjacent structures instead of being reflected to the adjacent sub-pixels. Therefore, it can increase the color purity of the display panel and improve the color shift phenomenon.

[0035] It should be understood that the method of manufacturing the bottom emission type organic light emitting display panel in the present embodiment further includes forming a thin film transistor on the substrate, that is making a semiconductor layer, a gate, a source and a drain. Also, making a gate line to connect the thin film transistor, a data line to connect the thin film transistor, and insulation layers used as insulation between the conductive layers. The method will not be described in detail herein.

Embodiments 2

[0036] As shown in FIG. 3, apart from the embodiment 1, the bottom emission type organic light emitting display panel of the present embodiment further comprises a reflector 80, the reflector 80 is provided in the pixel definition layer 30, and being used to reflect an incident light toward the adjacent organic light emitting layer 40.

[0037] The reflector 80 comprises a first reflective part 81 having a concave curved reflective surface, the first reflective part 81 is a rotating body, as well as comprises a second reflective part 82 covering one end of the first reflective part, edges of the second reflective part 82 are peripherally extended from the end of the first reflective part 81. A part of the light emitted from the organic emitting layer 40 to the pixel definition layer 30 is reflected back to the organic emitting layer 40 by the second reflective part 82, there are few parts of the light being reflected back to the second reflective part 82 through the first reflective part 81. Therefore, realizing the secondary utilization of the light emitted to the pixel definition layer 30, and improving the utilization of the light.

Embodiments 3

[0038] As shown in FIG. 4, apart from the embodiments 2, the reflector **80** of the present embodiment comprises a cylindrical reflective ring disposed vertically to the substrate **10**. The cylindrical reflective ring can reflect the light emitted from adjacent organic emitting layers **40** to prevent the interference between adjacent pixels, and improve the light utilization.

[0039] In the bottom emission type organic light emitting display panel of the present disclosure, the cathode having reflective function is only made in light emitting region, and the cathode having the reflective function is not made in non-emitting region. That can prevent sub-pixels from light interference emitted from adjacent sub-pixels as well as increase color purity and improve color shift phenomenon of bottom emission type device.

[0040] Finally, it should be noted that the above embodiments are merely illustrative of the technical solutions of the present disclosure and are not intended to be limiting thereof. For the person skilled in the art of the disclosure, without departing from the concept of the disclosure, simple deductions or substitutions can be made and should be included in the protection scope of the disclosure.

What is claimed is:

1. An organic light emitting display panel comprising a substrate, an anode provided on the substrate, a pixel definition layer, an organic light emitting layer, and a cathode having reflective function, wherein a plurality of open slots are provided on the pixel definition layer, one end of the open slot adjacent to the substrate is disposed on the anode, the organic light emitting layer is packed in the open slot, the cathode is disposed on the organic light emitting layer and being contained in the open slot.

2. The organic light emitting display panel according to claim 1, further comprising a conductive layer, wherein the conductive layer is disposed above the pixel definition layer and the cathode, and full covers the pixel definition layer and the cathode.

3. The organic light emitting display panel according to claim 2, wherein the conductive layer is mesh-shaped and connected to all the cathodes.

4. The organic light emitting display panel according to claim 2, wherein the conductive layer is flake-shaped and full covering the pixel definition layer and the anode.

5. The organic light emitting display panel according to claim 2, further comprising a thin film encapsulation layer, wherein the thin film encapsulation layer covers an outer surface of the conductive layer.

6. The organic light emitting display panel according to claim 1, further comprising a reflector, wherein the reflector is provided in the pixel definition layer and being used to reflect an incident light toward adjacent organic light emitting layer.

7. The organic light emitting display panel according to claim 6, wherein the reflector comprises a first reflective part having a concave curved reflective surface, the first reflective part is a rotating body.

8. The organic light emitting display panel according to claim 7, wherein the reflector further comprises a second reflective part covering one end of the first reflective part, edges of the second reflective part are peripherally extended from the end of the first reflective part.

9. The organic light emitting display panel according to claim 6, wherein the reflector comprises a cylindrical reflective ring disposed vertically to the substrate.

10. The organic light emitting display panel according to claim 2, further comprising a reflector, wherein the reflector is provided in the pixel definition layer and being used to reflect an incident light toward adjacent organic light emitting layer.

11. The organic light emitting display panel according to claim 10, wherein the reflector comprises a first reflective part having a concave curved reflective surface, the first reflective part is a rotating body.

12. The organic light emitting display panel according to claim 11, wherein the reflector further comprises a second reflective part covering one end of the first reflective part, edges of the second reflective part are peripherally extended from the end of the first reflective part.

13. The organic light emitting display panel according to claim 10, wherein the reflector comprises a cylindrical reflective ring disposed vertically to the substrate.

14. A method of manufacturing an organic light emitting display panel, wherein the panel comprises a substrate, an anode provided on the substrate, a pixel definition layer, an organic light emitting layer, and a cathode having reflective function, a plurality of open slots are provided on the pixel definition layer, one end of the open slot adjacent to the substrate is disposed on the anode, the organic light emitting layer is packed in the open slot, the cathode is disposed on the organic light emitting layer and being contained in the open slot; the method comprising: providing the substrate, and making the transparent anode, the pixel definition layer, the organic light emitting layer, and the cathode having reflective function on the substrate, wherein the cathode covers only on the organic light emitting layer.

15. The method of manufacturing an organic light emitting display panel according to claim 14, further comprising a conductive layer, wherein the conductive layer is disposed above the pixel definition layer and the cathode, and full covers the pixel definition layer and the cathode.

16. The method of manufacturing an organic light emitting display panel according to claim 14, further comprising a reflector, wherein the reflector is provided in the pixel definition layer and being used to reflect an incident light toward adjacent organic light emitting layer.

17. The method of manufacturing an organic light emitting display panel according to claim 16, wherein the reflector comprises a first reflective part having a concave curved reflective surface, the first reflective part is a rotating body.

18. The method of manufacturing an organic light emitting display panel according to claim 17, wherein the reflector further comprises a second reflective part covering one end of the first reflective part, edges of the second reflective part are peripherally extended from the end of the first reflective part.

19. The method of manufacturing an organic light emitting display panel according to claim 16, wherein the reflector comprises a cylindrical reflective ring disposed vertically to the substrate.

20. The method of manufacturing an organic light emitting display panel according to claim 15, further comprising a reflector, wherein the reflector is provided in the pixel definition layer and being used to reflect an incident light toward adjacent organic light emitting layer.

专利名称(译)	有机发光显示面板及其制造方法		
公开(公告)号	US20190067625A1	公开(公告)日	2019-02-28
申请号	US15/576887	申请日	2017-08-03
[标]发明人	YU WEI		
发明人	YU, WEI		
IPC分类号	H01L51/52 H01L27/32		
CPC分类号	H01L51/5231 H01L51/5271 H01L27/3246 H01L27/3244 H01L51/5221 H01L51/56 H01L51/5225 H01L33/60 H01L51/5203 H01L51/5209		
优先权	201710600826.5 2017-07-21 CN		
其他公开文献	US10446624		
外部链接	Espacenet USPTO		

摘要(译)

提供一种有机发光显示面板，包括基板，透明阳极，像素限定层，有机发光层和在基板上提供的具有反射功能的多个阴极。在像素定义层上提供多个开口槽。阳极设置在开口槽的与基板相邻的一端上，有机发光层填充在开口槽中，阴极设置在开口槽的远离基板的另一侧。还提供了一种制造有机发光显示面板的方法。反射阴极仅在发光区域制成，可以防止子像素受到相邻子像素发出的光干扰，并且增加色纯度并改善底部发射型器件中的色移现象。

