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(54) **OLED TOUCH DISPLAY PANEL AND OLED TOUCH DISPLAY**

(71) Applicant: **WUHAN CHINA STAR OPTOELECTRONICS SEMICONDUCTOR DISPLAY TECHNOLOGY CO., LTD.**, Wuhan, Hubei (CN)

(72) Inventor: **Peng LI**, Wuhan, Hubei (CN)

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(52) **U.S. Cl.**

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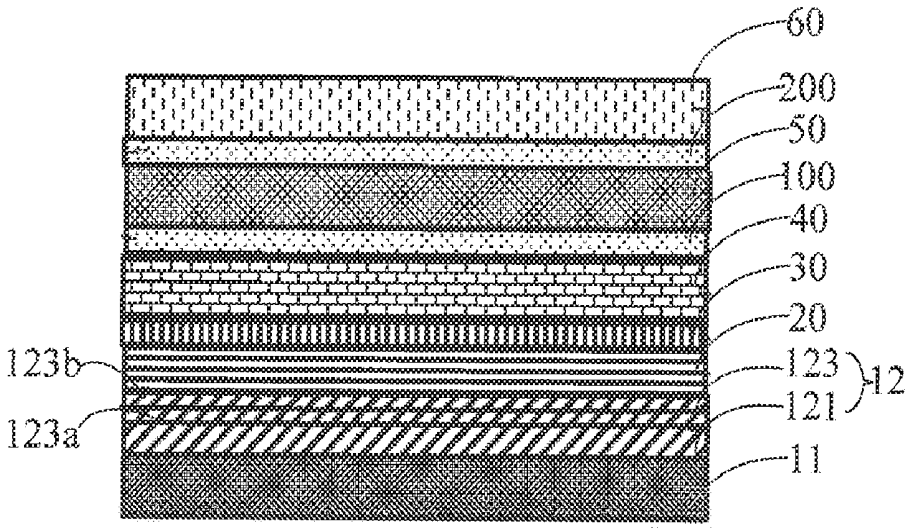
(57) **ABSTRACT**

The present disclosure provides an organic light emitting diode (OLED) touch display panel and an organic light emitting diode (OLED) touch display. The OLED touch display panel includes an array substrate, an OLED layer disposed on the array substrate, an encapsulation layer disposed on the OLED layer and the array substrate, and a touch structural layer disposed on the encapsulation layer. According to the present disclosure, the touch structural layer is directly disposed on the encapsulation layer without the need to use a specific glass substrate, therefore reducing thickness of the OLED touch display panel.



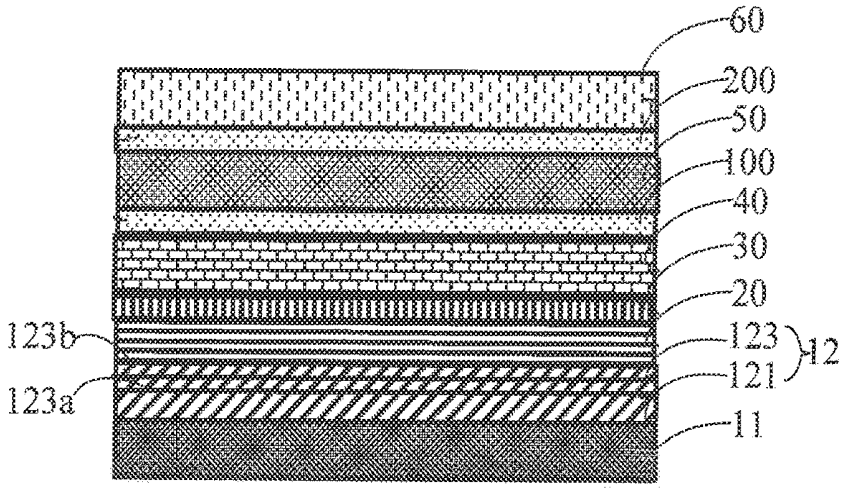


FIG. 1

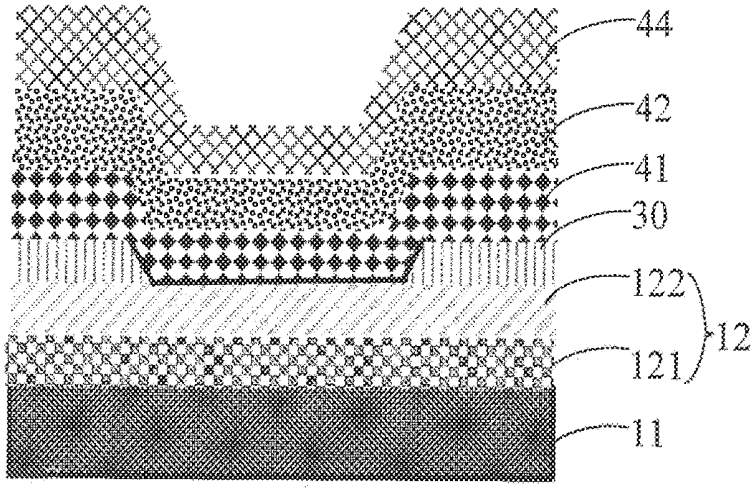


FIG. 2

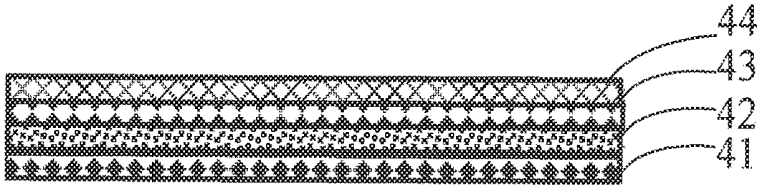


FIG. 3

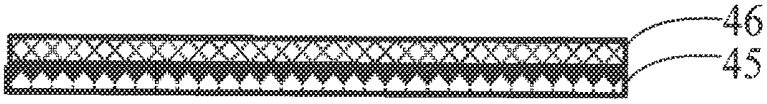


FIG. 4

OLED TOUCH DISPLAY PANEL AND OLED TOUCH DISPLAY

FIELD OF THE DISCLOSURE

[0001] The present disclosure relates to the field of organic light emitting diode (OLED) displays, and more particularly to an OLED touch display panel and an OLED touch display.

BACKGROUND

[0002] Generally, a flexible OLED touch display screen includes a flexible OLED display screen and a touch screen disposed on the flexible OLED display screen. The touch screen includes a glass substrate and a touch circuit disposed on the glass substrate. However, such design where the touch screen is disposed on the flexible OLED display screen increases thickness of the flexible OLED touch display screen.

[0003] Therefore, there is a need to solve the problems encountered by the prior art

SUMMARY OF THE DISCLOSURE

[0004] One of the objectives of the present disclosure is to provide an OLED touch display panel and an OLED touch display for reducing the thickness of the OLED touch display panel.

[0005] To solve the above-mentioned problems, the present disclosure provides the following technical schemes.

[0006] The present disclosure provides an organic light emitting diode (OLED) touch display panel, comprising:

[0007] an array substrate;

[0008] an OLED layer disposed on the array substrate;

[0009] an encapsulation layer disposed on the OLED layer and the array substrate; and

[0010] a touch structural layer disposed on the encapsulation layer.

[0011] In the OLED touch display panel of the present disclosure,

[0012] the touch structural layer has a projected capacitive touch structure, wherein the touch structural layer includes a first conductive layer, a first insulation layer, a second conductive layer, and a second insulation layer; and

[0013] the first conductive layer is disposed on the encapsulation layer, the first insulation layer is disposed on the first conductive layer, the second conductive layer is disposed on the first insulation layer, and the second insulation layer is disposed on the second conductive layer.

[0014] In the OLED touch display panel of the present disclosure,

[0015] the array substrate includes a flexible substrate, a driving circuit layer disposed on the flexible layer, and a pixel structural layer;

[0016] the pixel structural layer includes a pixel circuit layer and an OLED anode electrode layer, wherein the OLED anode electrode layer is disposed on the pixel circuit layer and the pixel circuit layer is disposed on the flexible substrate; and

[0017] the driving circuit layer is electrically connected to the first conductive layer and the pixel structural layer, wherein the driving circuit layer is configured to drive the pixel structural layer and the first conductive layer.

[0018] In the OLED touch display panel of the present disclosure, the encapsulation layer includes a through-hole to expose the driving circuit layer of the array substrate, and the first conductive layer contacts and is electrically connected to the driving circuit layer via the through-hole.

[0019] In the OLED touch display panel of the present disclosure, the first conductive layer and the second conductive layer are made of a transparent conductive material.

[0020] In the OLED touch display panel of the present disclosure, the touch structural layer has a lateral capacitive touch structure, wherein the touch structural layer includes a third conductive layer disposed on the encapsulation layer and a fourth insulation layer disposed on the third conductive layer.

[0021] In the OLED touch display panel of the present disclosure, the OLED touch display panel further comprises a polarizer plate and a first bonding layer, wherein the first bonding layer is disposed on the touch structural layer, and the polarizer plate is disposed on the bonding layer.

[0022] In the OLED touch display panel of the present disclosure, the OLED touch display panel further comprises a cover plate and a second bonding layer, wherein the second bonding layer is disposed on the polarizer plate, and the cover plate is disposed on the second bonding layer.

[0023] In the OLED touch display panel of the present disclosure,

[0024] the OLED layer includes a hole injection layer, a electroluminescent layer, an electron injection layer, and a cathode electrode layer; and

[0025] the hole injection layer is disposed on the array substrate, the electroluminescent layer is disposed on the hole injection layer, the electron injection layer is disposed on the electroluminescent layer, and the cathode electrode layer is disposed on the electron injection layer.

[0026] Additionally, the present disclosure provides an organic light emitting diode (OLED) touch display, comprising the OLED touch display panel as described above.

[0027] Compared to conventional techniques, the present disclosure is characterized by directly disposing the touch structural layer on the encapsulation layer without the need to use a specific glass substrate, therefore the thickness of the OLED touch display panel is reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] FIG. **1** is a cross-sectional view of a display area of an OLED touch display panel according to a preferred embodiment of the present disclosure.

[0029] FIG. **2** is a cross-sectional view of an output end of a touch driving circuit layer in a non-display area of an OLED touch display panel according to a preferred embodiment of the present disclosure.

[0030] FIG. **3** is a cross-sectional view of a touch structural layer according to a preferred embodiment of the present disclosure.

[0031] FIG. **4** is a cross-sectional view of a touch structural layer according to another preferred embodiment of the present disclosure.

DETAILED DESCRIPTION

[0032] The following embodiments refer to the accompanying drawings for exemplifying specific implementable embodiments of the present disclosure. Moreover, directional terms described by the present disclosure, such as upper, lower, front, back, left, right, inner, outer, side, etc., are only directions by referring to the accompanying draw-

ings, and thus the used directional terms are used to describe and understand the present disclosure, but the present disclosure is not limited thereto. In the drawings, the same reference symbol represents the same or similar components.

[0033] In the drawings, similar elements are represented by similar reference numerals.

[0034] Please refer to FIGS. **1** and **2**. FIG. **1** is a cross-sectional view of a display area of an OLED touch display panel according to a preferred embodiment of the present disclosure. FIG. **2** is a cross-sectional view of an output end of a touch driving circuit layer in a non-display area of an OLED touch display panel according to a preferred embodiment of the present disclosure.

[0035] The OLED touch display panel includes an array substrate **10**, an OLED layer **20**, an encapsulation layer **30**, a touch structural layer **40**, a polarizer plate **50**, and a cover plate **60**. The OLED layer **20** is disposed on the array substrate **10**. The encapsulation layer **30** is disposed on the OLED layer **20** and the array substrate **10**. The touch structural layer **40** is disposed on the encapsulation layer **30**. The polarizer plate **50** is disposed on the touch structural layer **40**. The cover plate **60** is disposed on the polarizer plate **50**.

[0036] In this embodiment of the present disclosure, the array substrate **10** includes a flexible substrate **11** and an array structure **12** disposed on the flexible substrate **11**. The array structure **12** includes a third insulation layer **121**, a driving circuit layer **122** (as shown in FIG. **2**), and a pixel structural layer **123** (as shown in FIG. **1**). The third insulation layer **121** is disposed on the flexible substrate **11**. The driving circuit layer **122** and the pixel structural layer **123** are both disposed on the third insulation layer **121**. The encapsulation layer **30** is disposed on the driving circuit layer **122** and the OLED layer **20**. The driving circuit layer **122** is located in a non-display area of the OLED touch display panel. The pixel structural layer **123** is located in a display area of the OLED touch display panel.

[0037] The third insulation layer **121** is made of a material, such as silicon nitride and silicon oxide, and is formed by a chemical vapor deposition process. The driving circuit layer **122** and the pixel structural layer **123** are both formed by a low temperature polysilicon thin-film transistor (LTPS TFT) technique.

[0038] The OLED layer **20** is disposed on the array structure **12**. Specifically, the OLED layer **20** is between the encapsulation layer **30** and the pixel structural layer **123**. The pixel structural layer **123** includes a pixel circuit layer **123***a* and an OLED anode electrode layer **123***b*. The pixel circuit layer **123***a* is disposed on the third insulation layer **121**. The OLED anode electrode layer **123***b* is disposed on the pixel circuit layer **123***a*. The OLED layer **20** includes a hole injection layer, a electroluminescent layer, an electron injection layer, and a cathode electrode layer. The hole injection layer is disposed on the OLED anode electrode layer. The electroluminescent layer is disposed on the hole injection layer. The electron injection layer is disposed on the electroluminescent layer. The cathode electrode layer is disposed on the electron injection layer.

[0039] The encapsulation layer **30** is a thin-film encapsulation layer, which is made of a hydrophobic material and has a property of blocking oxygen gas. It is understood that the encapsulation layer **30** can also consist of a silicon nitride insulation layer and a thin-film encapsulation layer. The encapsulation layer **30** covers the driving circuit layer **122** of the array structure **12** and the cathode electrode layer of the OLED layer **20**.

[0040] The OLED touch display panel further includes a first bonding layer **100** configured for connecting the polarizer plate to the touch structural layer. The first bonding layer **100** is disposed on the touch structural layer. The polarizer plate is disposed on the first bonding layer **100**.

[0041] The cover plate **60** is a glass cover plate, or is a thin film with good scratch resisting ability. The OLED touch display panel further includes a second bonding layer **200** configured for connecting the polarizer plate **50** to the cover plate **60**. The second bonding layer **200** is disposed on the polarizer plate **50**. The cover plate **60** is disposed on the second bonding layer **200**.

[0042] The touch structural layer **40** is configured for receiving touch operation signals triggered by the users.

[0043] In this embodiment, the driving circuit layer **122** includes a display driving circuit layer and a touch driving circuit layer. The display driving circuit layer and the touch driving circuit layer are at the same height level. The touch driving circuit layer is electrically connected to the touch structural layer **40**, and the display driving circuit layer is electrically connected to the pixel structural layer **123**. The driving circuit layer **122** is configured for driving the pixel structural layer **123** and the touch structural layer **40**.

[0044] In this embodiment, the touch driving circuit layer of the driving circuit layer **122** on the array substrate **10** can be alternatively used to drive the touch structural layer **40**. The touch structural layer **40** is electrically connected to the output end of the touch driving circuit layer of the driving circuit layer **122** (see FIG. **2**).

[0045] Please refer to FIG. **3**, which shows one preferred embodiment where the touch structural layer **40** has a projected capacitive touch structure. The touch structural layer **40** includes a first conductive layer **41**, a first insulation layer **42**, a second conductive layer **43**, and a second insulation layer **44**. The first conductive layer **41** is disposed on the encapsulation layer **30**. The first insulation layer **42** is disposed on the first conductive layer **41**. The second conductive layer **43** is disposed on the first insulation layer **42**. The second insulation layer **44** is disposed on the second conductive layer **43**.

[0046] The first conductive layer **41** and the second conductive layer **43** are both made of a transparent conductive material, such as indium tin oxide (ITO). In the manufacturing process of the display, a physical vapor deposition process is used to form the first conductive layer **41** on the encapsulation layer **30**, and then the first conductive layer **41** is patterned by a lithographic process to form a plurality of first touch electrodes. Similarly, a physical vapor deposition process is used to form the second conductive layer **43** on the first insulation layer **42**, and then the second conductive layer **43** is patterned by a lithographic process to form a plurality of second touch electrodes. A plurality of touch capacitors are thus formed with each of the first touch electrodes corresponding to and being opposite to one of the second touch electrodes.

[0047] The first insulation layer **42** and the second conductive layer **43** can be made of an insulation material, such as silicon nitride or silicon oxide, and can be formed by a chemical vapor deposition process.

[0048] To achieve connection between the first conductive layer **41** and the output end of the touch driving circuit layer

of the driving circuit layer **122**, a through-hole **300** is formed in the encapsulation layer **30** at location where the output end of the touch driving circuit layer of the driving circuit layer **122** is located. The first conductive layer **41** contacts and is electrically connected to the output end of the touch driving circuit layer of the driving circuit layer **122** via the through-hole **300**.

[0049] Please also refer to FIG. **4**. In other embodiments, the touch structural layer **40** has a lateral capacitive touch structure. The touch structural layer **40** includes a third conductive layer **45** disposed on the encapsulation layer **30** and a fourth insulation layer **46** disposed on the third conductive layer **45**. The third conductive layer **45** is made of a transparent conductive material, such as indium tin oxide (ITO). In the manufacturing process of the display, a physical vapor deposition process is used to form the third conductive layer **45** on the encapsulation layer **30**, and then the third conductive layer **45** is patterned by a lithographic process to form a plurality of touch electrodes. The touch electrodes and other neighboring touch electrodes constitute a plurality of capacitors, which can be used to sense the touch operations of the users.

[0050] Compared to conventional techniques, the present disclosure is characterized by directly disposing the touch structural layer on the encapsulation layer without the need to use a specific glass substrate, therefore the thickness of the OLED touch display panel is reduced.

[0051] Additionally, the present disclosure provides an OLED touch display, comprising the OLED touch display as described in the above embodiments.

[0052] While the present disclosure has been described with the aforementioned preferred embodiments, it is preferable that the above embodiments should not be construed as limiting of the present disclosure. Anyone having ordinary skill in the art can make a variety of modifications and variations without departing from the spirit and scope of the present disclosure as defined by the following claims.

What is claimed is:

1. An organic light emitting diode (OLED) touch display panel, comprising:

an array substrate;

an OLED layer disposed on the array substrate;

an encapsulation layer disposed on the OLED layer and the array substrate; and

a touch structural layer disposed on the encapsulation layer.

2. The OLED touch display panel according to claim **1**, wherein

the touch structural layer has a projected capacitive touch structure, wherein the touch structural layer includes a first conductive layer, a first insulation layer, a second conductive layer, and a second insulation layer; and

the first conductive layer is disposed on the encapsulation layer, the first insulation layer is disposed on the first conductive layer, the second conductive layer is disposed on the first insulation layer, and the second insulation layer is disposed on the second conductive layer.

3. The OLED touch display panel according to claim **2**, wherein

the array substrate includes a flexible substrate, a driving circuit layer disposed on the flexible layer, and a pixel structural layer;

the pixel structural layer includes a pixel circuit layer and an OLED anode electrode layer, wherein the OLED anode electrode layer is disposed on the pixel circuit layer and the pixel circuit layer is disposed on the flexible substrate; and

the driving circuit layer is electrically connected to the first conductive layer and the pixel structural layer, wherein the driving circuit layer is configured to drive the pixel structural layer and the first conductive layer.

4. The OLED touch display panel according to claim **3**, wherein the encapsulation layer includes a through-hole to expose the driving circuit layer of the array substrate, and the first conductive layer contacts and is electrically connected to the driving circuit layer via the through-hole.

5. The OLED touch display panel according to claim **2**, wherein the first conductive layer and the second conductive layer are made of a transparent conductive material.

6. The OLED touch display panel according to claim **3**, wherein the first conductive layer and the second conductive layer are made of a transparent conductive material.

7. The OLED touch display panel according to claim **4**, wherein the first conductive layer and the second conductive layer are made of a transparent conductive material.

8. The OLED touch display panel according to claim **1**, wherein the touch structural layer has a lateral capacitive touch structure, wherein the touch structural layer includes a third conductive layer disposed on the encapsulation layer and a fourth insulation layer disposed on the third conductive layer.

9. The OLED touch display panel according to claim **2**, further comprising a polarizer plate and a first bonding layer, wherein the first bonding layer is disposed on the touch structural layer, and the polarizer plate is disposed on the bonding layer.

10. The OLED touch display panel according to claim **9**, further comprising a cover plate and a second bonding layer, wherein the second bonding layer is disposed on the polarizer plate, and the cover plate is disposed on the second bonding layer.

11. The OLED touch display panel according to claim **1**, wherein

the OLED layer includes a hole injection layer, a electroluminescent layer, an electron injection layer, and a cathode electrode layer; and

the hole injection layer is disposed on the array substrate, the electroluminescent layer is disposed on the hole injection layer, the electron injection layer is disposed on the electroluminescent layer, and the cathode electrode layer is disposed on the electron injection layer.

12. An organic light emitting diode (OLED) touch display panel, comprising:

an array substrate;

an OLED layer disposed on the array substrate;

an encapsulation layer disposed on the OLED layer and the array substrate; and

a touch structural layer disposed on the encapsulation layer;

wherein:

the touch structural layer has a projected capacitive touch structure;

the touch structural layer includes a first conductive layer, a first insulation layer, a second conductive layer, and a second insulation layer,

the first conductive layer is disposed on the encapsulation layer, the first insulation layer is disposed on the first conductive layer, the second conductive layer is disposed on the first insulation layer, and the second insulation layer is disposed on the second conductive layer;

the array substrate includes a flexible substrate, a driving circuit layer disposed on the flexible layer, and a pixel structural layer;

the pixel structural layer includes a pixel circuit layer and an OLED anode electrode layer, wherein the OLED anode electrode layer is disposed on the pixel circuit layer and the pixel circuit layer is disposed on the flexible substrate;

the driving circuit layer is electrically connected to the first conductive layer and the pixel structural layer, wherein the driving circuit layer is configured to drive the pixel structural layer and the first conductive layer;

the encapsulation layer includes a through-hole to expose the driving circuit layer of the array substrate, and the first conductive layer contacts and is electrically connected to the driving circuit layer via the through-hole;

the first conductive layer and the second conductive layer are made of a transparent conductive material;

the touch structural layer has a lateral capacitive touch structure, wherein the touch structural layer includes a third conductive layer disposed on the encapsulation layer and a fourth insulation layer disposed on the third conductive layer;

the OLED layer includes a hole injection layer, a electroluminescent layer, an electron injection layer, and a cathode electrode layer; and

the hole injection layer is disposed on the array substrate, the electroluminescent layer is disposed on the hole injection layer, the electron injection layer is disposed on the electroluminescent layer, and the cathode electrode layer is disposed on the electron injection layer.

13. An organic light emitting diode (OLED) touch display, comprising the OLED touch display panel according to claim **1**.

* * * * *

专利名称(译)	OLED触摸显示面板和OLED触摸显示屏		
公开(公告)号	US20190051707A1	公开(公告)日	2019-02-14
申请号	US15/572166	申请日	2017-09-06
[标]发明人	LI PENG		
发明人	LI, PENG		
IPC分类号	H01L27/32 H01L51/52 H01L51/00 G06F3/041 G06F3/044		
CPC分类号	H01L27/323 H01L51/5253 H01L51/0097 H01L27/3244 G06F3/0412 G06F3/044 G06F3/0445 G06F2203/04102 G06F2203/04103		
优先权	201710692233.6 2017-08-14 CN		
外部链接	Espacenet USPTO		

摘要(译)

本发明提供一种有机发光二极管（OLED）触控显示面板及有机发光二极管（OLED）触控显示器。 OLED触控显示面板包括阵列基板，设置在阵列基板上的OLED层，设置在OLED层和阵列基板上的封装层，以及设置在封装层上的触控结构层。根据本发明，触控结构层直接设置于封装层上，无需使用特定的玻璃基板，因此减小了OLED触控显示面板的厚度。