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(54) ORGANIC LIGHT-EMITTING DIODE DISPLAY PANEL, MANUFACTURING METHOD THEREFOR, AND DISPLAY APPARATUS

ANZEIGETAFEL MIT ORGANISCHEN LEUCHTDIODEN, HERSTELLUNGSVERFAHREN DAFÜR SOWIE ANZEIGEVORRICHTUNG

PANNEAU D'AFFICHAGE À DIODE ÉLECTROLUMINESCENTE ORGANIQUE, SON PROCÉDÉ DE FABRICATION, ET APPAREIL D'AFFICHAGE

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to the field of organic light emitting diode display technology, in particular to an organic light emitting diode display panel and its manufacturing method, as well as a display device.

BACKGROUND

[0002] An active matrix organic light emitting diode display panel attracts tremendous attentions and is becoming a mainstream display panel as its advantages such as being light, ultrathin and of a high contrast.

[0003] US 2014/183472 A1 discloses a transparent organic light emitting display device and a method of manufacturing the transparent organic light emitting display device. The transparent organic light emitting display device comprises a plurality of subpixel regions, each having an emissive area and a transmissive area, wherein three thin film transistors are disposed in the emissive area and an organic light emitting element is electrically connected to the thin film transistor. While the emissive area emits light to display an image on the display device, the transmissive area allows external light to be passed through the display device so that objects behind the display device can be viewed simultaneously with the displayed image.

[0004] JP 2009 176495 A provides an organic EL device that can improve the conductivity among electrodes and reduce variations in the emission luminance. JP 2009 176495 A further provides a manufacturing method for such an organic EL device.

[0005] WO 2013/186916 A1 discloses an organic EL device with an insulating bank arranged on a translucent substrate, a translucent electrode also arranged on the translucent substrate and in contact with the insulating bank, an organic layer formed on the translucent electrode and including a light-emitting layer, and a reflective electrode formed on the organic layer. The insulating bank is made from a translucent material having a refractive index that is equal to or less than the refractive index of the translucent electrode and further comprises a film of a material having a low refractive index, wherein said film is in contact with the translucent electrode and the translucent substrate. The translucent electrode comprises an uneven side surface that is in contact with the film of a material having a low refractive index and that intersects a main surface of the translucent substrate.

[0006] Referring to Fig.1, a structural schematic view showing an organic light emitting diode (OLED) display panel in the related art, the OLED display panel includes: a base substrate 101, a buffer layer 102, an active layer 103, a gate insulating layer 104, a gate electrode 105, an interlayer insulating layer 106, a source/drain electrode 107, a passivation layer 108, a planarization layer 109, a first electrode 110, an organic light emitting layer 111, a second electrode 112, a pixel defining layer 113 and a glass packaging substrate 114.

[0007] In general, the OLED display panel in the related art is of a low luminous efficiency, because that a light is totally reflected when entering an interface between the pixel defining layer 113 (being of a refractive index of about 1.8) and the glass packaging substrate 114 (being of a refractive index of about 1.5) and an interface between the glass packaging substrate 114 and an atmosphere (being of a refractive index of about 1) at an angle larger than the total reflection angle at the interface therebetween, as a result, about 20% in the total amount of emitting light emitting from the organic light emitting layer exits out and the rest light (about 80%) is restricted in the form of a guided wave inside the pixel defining layer 113 and the glass packaging substrate 114, which results in a decrease of the luminous efficiency.

[0008] Therefore, it is urgent to solve the technical problem to increase the luminous efficiency of the OLED display panel.

SUMMARY

[0009] Accordingly, an object of the present disclosure is to provide in embodiments an organic light emitting diode (OLED) display panel and its manufacturing method, as well as a display device, so as to solve the problem of the existing OLED display panel that the luminous efficiency is low.

[0010] In order to solve the above problem, the present disclosure provides an organic light emitting diode (OLED) display panel with the features of claim 1 and a method for manufacturing an organic light emitting diode (OLED) display panel with the features of claim 9.

[0011] Alternatively, the first light-processing layer is made of magnesium fluoride, silicon dioxide or aluminium fluoride.

[0012] Alternatively, the total reflection-eliminating layer includes at least two second light-processing layers laminated on the first light-processing layer successively, and being of refractive indexes increasing successively in a direction away from the first light-processing layer.

[0013] Alternatively, the second light-processing layer is made of yttrium oxide, magnesium oxide, zirconium oxide, zinc sulfide, zinc selenide or titanium dioxide.

[0014] Alternatively, the pixel defining layer is provided with via holes at both sides of the organic light emitting unit, and the via holes are filled with the total reflection-eliminating layer.

[0015] Alternatively, the organic light emitting unit includes: a first electrode, the organic light emitting layer and a second electrode.

[0016] Alternatively, the first electrode is arranged as an anode, and the second electrode is arranged as a cathode.

[0017] The present disclosure further provides in embodiments an organic light emitting diode (OLED) display

device, which includes the above OLED display panel.

[0018] The present disclosure has the following beneficial effects. According to embodiment of the present disclosure, the pixel defining layer is provided with a via hole at at least one side of the organic light emitting unit, and the via hole is filled with a total reflection-eliminating layer through which incident light from the pixel defining layer is processed to obtain emergent light capable of arriving at an interface between a packaging substrate and an atmosphere at an incident angle smaller than a total reflection angle at the interface between the packaging substrate and the atmosphere, so as to reduce the total reflection, thereby to improve luminous efficiency of the OLED display panel. Further, it may avoid that the light emitting from the organic light emitting layers of adjacent subpixels is excited by each other which may result in a decrease of the service life of the organic light emitting layer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

Fig.1 is a structural schematic view showing an OLED display panel in the related art;

Fig.2 is a structural schematic view showing an OLED display panel according to an embodiment of the present disclosure; and

Fig.3 is a diagram showing a light path in a total reflection-eliminating layer according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0020] In order to make the objects, the technical solutions and the advantages of the present disclosure more apparent, the present disclosure will be described hereinafter in conjunction with the drawings and the embodiments.

[0021] The present disclosure provides in embodiments an organic light emitting diode (OLED) display panel, which includes a base substrate; and an organic light emitting unit, a pixel defining layer and a packaging substrate, arranged on the base substrate, wherein the pixel defining layer is provided with a via hole at at least one side of the organic light emitting unit. The via hole is filled with a total reflection-eliminating layer through which incident light is processed to obtain emergent light capable of arriving at an interface between the packaging substrate and an atmosphere at an incident angle smaller than the total reflection angle at the interface between the packaging substrate and the atmosphere.

[0022] The light emitting unit includes: a first electrode, an organic light emitting layer and a second electrode. Normally, the first electrode is arranged as an anode, and the second electrode is arranged as a cathode.

[0023] In general, the packaging substrate is a glass packaging substrate, with a refractive index of about 1.5. The refractive index of air is about 1.

[0024] Light is totally reflected when entering into an optically thinner medium being of a smaller refractive index from an optically denser medium being of a larger refractive index at an incident angle larger than the total reflection angle at the interface between the optically denser medium and the optically thinner medium, thereby decrease the luminous efficiency.

[0025] In other words, in an OLED display panel, light emitting from the organic light emitting layer of the organic light emitting unit usually enters the pixel defining layer at an incident angle which is usually large, as a result, the light may be totally reflected both at the interface between the pixel defining layer and the glass packaging substrate and the interface between the glass packaging substrate and the atmosphere, which leads to a decrease of luminous efficiency of the OLED display panel.

[0026] In order to improve the luminous efficiency, in an embodiment of the present disclosure, the pixel defining layer is provided with a via hole at at least one side of the organic light emitting unit, and the via hole is filled with a total reflection-eliminating layer through which incident light from the pixel defining layer is processed to obtain emergent light capable of arriving at the interface between the packaging substrate and the atmosphere at an incident angle smaller than a total reflection angle at the interface between the packaging substrate and the atmosphere, so as to reduce the total reflection, thereby to improve the luminous efficiency of the OLED display panel. Further, it may avoid that the light emitting from the organic light emitting layers of adjacent subpixels is excited by each other which may result in a decrease of the service life of the organic light emitting layer.

[0027] In embodiments of the present disclosure, the pixel defining layer may be provided with the via hole for filling the total reflection-eliminating layer merely at one side of the organic light emitting unit; or at both sides of the organic light emitting unit. It would be appreciated that setting via holes in the pixel defining layer at both sides of the organic light emitting unit may further improve the luminous efficiency of the OLED display panel, as compared with setting the via hole in the pixel defining layer merely at one side of the organic light emitting unit.

[0028] The structure of the total reflection-eliminating layer is described in details as follows.

[0029] In an example not forming part of the invention as claimed, the total reflection-eliminating layer may be of a single-layer structure. In an embodiment of the invention as claimed, the total reflection-eliminating layer is a multilayer structure.

[0030] The total reflection-eliminating layer being of the single-layer structure may include: a first light-processing layer, being of a thickness larger than the organic light emitting layer of the organic light emitting unit, and a refractive index smaller than the pixel defining layer.

[0031] The first light-processing layer is of the thickness larger than the organic light emitting layer of the

organic light emitting unit, so as to guarantee that the light emitting from the organic light emitting layer to the pixel defining layer can be processed by the first light-processing layer.

[0032] The first light-processing layer is of the refractive index smaller than the pixel defining layer, so that when light enters into the first light-processing layer from the pixel defining layer, an angle between the refracted light and the normal is larger than that between the incident light and the normal. The normal is perpendicular to an interface between the pixel defining layer and the first light-processing layer.

[0033] The first light-processing layer may be made of a material, such as magnesium fluoride, silicon dioxide and aluminum fluoride.

[0034] The total reflection-eliminating layer being of a multilayer structure includes:

a first light-processing layer, being of a thickness larger than the organic light emitting layer of the organic light emitting unit, and a refractive index smaller than the pixel defining layer;
at least one second light-processing layer laminated on the first light-processing layer, being of a refractive index larger than the first light-processing layer.

[0035] The first light-processing layer is of the refractive index smaller than the pixel defining layer, so that when the light enters into the first light-processing layer from the pixel defining layer, an angle between the refracted light and the normal is larger than that between the incident light and the normal The normal is perpendicular to an interface between the pixel defining layer and the first light-processing layer.

[0036] The second light-processing layer is of the refractive index larger than the first light-processing layer, so that when the light enters into the second light-processing layer from the first light-processing layer, an angle between the refracted light and the normal is smaller than that between the incident light and the normal. This normal is perpendicular to an interface between the first light-processing layer and the second light-processing layer.

[0037] The total reflection-eliminating layer may include one second light-processing layer, or a plurality of second light-processing layers. In the case that the total reflection-eliminating layer includes the plurality of the second light-processing layers, they are laminated on the first light-processing layer successively, and are of refractive indexes increasing successively in a direction away from the first light-processing layer, i.e., layers in the total reflection-eliminating layer are of refractive indexes changed in a gradient manner.

[0038] The second light-processing layer may be made of a material, such as yttrium oxide, magnesium oxide, zirconium oxide, zinc sulfide, zinc selenide and titanium dioxide.

[0039] The first light-processing layer and the second light-processing layer may be formed by an evaporation or sputtering method.

[0040] Referring to Fig.2, a structural schematic view showing an OLED display panel according to an embodiment of the present disclosure. The OLED display play includes: a base substrate 201, a buffer layer 202, an active layer 203, a gate insulating layer 204, a gate electrode 205, an interlayer insulating layer 206, a source/drain electrode 207, a passivation layer 208, a planarization layer 209, a first electrode 210, an organic light emitting layer 211, a second electrode 212, a pixel defining layer 213 and a glass packaging substrate 214. The pixel defining layer 213 is provided with a via hole, and the via hole is filled with a total reflection-eliminating layer. The total reflection-eliminating layer includes: a first light-processing layer 301, a first second light-processing layer 302 and a second second light-processing layer 303. The total reflection-eliminating layer processes light entering into the total reflection-eliminating layer from the pixel defining layer, so as to obtain emergent light capable of arriving at an interface between the packaging substrate and an atmosphere at an incident angle smaller than a total reflection angle at the interface between the packaging substrate and the atmosphere.

[0041] The first light-processing layer 301 is of a refractive index smaller than the pixel defining layer 213. The first second light-processing layer 302 is of a refractive index larger than the first light-processing layer 301. The second second light-processing layer 303 is of a refractive index larger than the first second light-processing layer 302.

[0042] A situation is assumed that the pixel defining layer 213 is of a refractive index n1 of 1.8, the first light-processing layer 301 is of a refractive index n2 of 1.1, the first second light-processing layer 302 is of a refractive index n3 of 1.7, and the second second light-processing layer 303 is of a refractive index n4 of 1.75; an angle (i.e., incident angle) between a first normal S1 and incident light entering the first light-processing layer 301 from the pixel defining layer 213 is $\angle 1$, an angle (i.e., refraction angle) between the first normal S1 and refracted light is $\angle 2$, and the first normal S1 is perpendicular to an interface between the pixel defining layer 213 and the first light-processing layer 301.

[0043] Referring to Fig.3, a schematic diagram showing a light path in a total reflection-eliminating layer according to an embodiment of the present disclosure, an angle (i.e., incident angle) between second normal S2 and incident light entering the first second light-processing layer 302 from the first light-processing layer 301 is $\angle 3$, an angle (i.e., refraction angle) between the second normal S2 and refracted light is $\angle 4$, an angle (i.e., incident angle) between the second normal S2 and incident light entering the second second light-processing layer 303 from the first second light-processing layer 302 is $\angle 5$, and an angle (i.e., refraction angle) between the second normal S2 and refracted light is $\angle 6$. The second normal S2 is perpendicular to an interface between the packag-

ing substrate and the atmosphere.

[0044] According to a refractive index formula of $n \times \sin\angle\alpha = n' \times \sin\angle\beta$, in which n and n' are refractive indexes of two mediums, respectively, $\angle\alpha$ is an incident angle and $\angle\beta$ is a refraction angle.

[0045] Therefore, when light enters the first light-processing layer (n2=1.1) from the pixel defining layer 213 (n1=1.8), the refraction angle $\angle 2$ is larger than the incident angle $\angle 1$, so that an angle (i.e., $\angle 3$ which is the coangle of $\angle 2$) between refracted light and the second normal S2 is smaller than an angle between incident light and the second normal S2, thereby enable the refracted light to be closer to the second normal.

[0046] When light enters the first second light-processing layer (n3=1.7) from the first light-processing layer (n2=1.1), the refraction angle $\angle 4$ is smaller than the incident angle $\angle 3$, thereby enable the refracted light to be more closer to the second normal.

[0047] When light enters the second second light-processing layer 303 (n4=1.75) from the first second light-processing layer 302 (n3=1.7), the refraction angle $\angle 6$ is smaller than the incident angle $\angle 5$, thereby enable the refracted light to be more closer to the second normal.

[0048] Finally, it may enable the light arriving at the interface between the packaging substrate and the atmosphere at an incident angle smaller than the total reflection angle at the interface between the packaging substrate and the atmosphere, so as to reduce the total reflection, thereby to improve luminous efficiency.

[0049] The present disclosure further provides in embodiments an organic light emitting diode (OLED) display device, which includes the above OLED display panel.

[0050] The above are merely the preferred embodiments of the present disclosure. The invention is defined by the appended claims.

Claims

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

a base substrate (201); and
an organic light emitting unit (210, 211, 212), a pixel defining layer (213) and a packaging substrate (214), arranged on the base substrate (201),
wherein the pixel defining layer (213) is provided with a via hole at at least one side of the organic light emitting unit (210, 211, 212),
the via hole is filled with a total reflection-eliminating layer (301, 302, 303), through which incident light is processed to obtain emergent light capable of arriving at an interface between the packaging substrate and an atmosphere at an incident angle smaller than a total reflection angle at the interface between the packaging substrate and the atmosphere, **characterised in that** the total reflection-eliminating layer (301, 302, 303) comprises a first light-processing layer (301) being of a thickness larger than an organic light emitting layer (211) of the organic light emitting unit (210, 211, 212), and a refractive index smaller than the pixel defining layer (213), and **in that**
the total reflection-eliminating layer (301, 302, 303) further comprises at least one second light-processing layer (302, 303), laminated on the first light-processing layer (301), and being of a refractive index larger than the first light-processing layer (301).

2. The OLED display panel according to claim 1, wherein the first light-processing layer (301) is made of magnesium fluoride, silicon dioxide or aluminium fluoride.

3. The OLED display panel according to claim 1 or 2, wherein the total reflection-eliminating layer (301, 302, 303) comprises at least two second light-processing layers (302, 303), laminated on the first light-processing layer (301) successively, and being of refractive indexes increasing successively in a direction away from the first light-processing layer (301).

4. The OLED display panel according to any one of claims 1 to 3, wherein the second light-processing layer (302, 303) is made of yttrium oxide, magnesium oxide, zirconium oxide, zinc sulfide, zinc selenide or titanium dioxide.

5. The OLED display panel according to any one of claims 1 to 4, wherein the pixel defining layer (213) is provided with via holes at both sides of the organic light emitting unit, and the via holes are filled with the total reflection-eliminating layer.

6. The OLED display panel according to any one of claims 1 to 5, wherein the organic light emitting unit (210, 211, 212) comprises: a first electrode (210), the organic light emitting layer (211) and a second electrode (212).

7. The OLED display panel according to claim 6, wherein the first electrode (210) is arranged as an anode, and the second electrode (212) is arranged as a cathode.

8. An organic light emitting diode (OLED) display device, comprising the OLED display panel according to any one of claims 1 to 7.

9. A method for manufacturing an organic light emitting diode (OLED) display panel, comprising steps of:

providing a base substrate (201);
forming a first electrode (210) of an organic light emitting unit (210, 211, 212) and a pixel defining layer (213) on the base substrate (201);
forming a via hole in the pixel defining layer (213) at at least one side of the organic light emitting unit (210, 211, 212);
filling the via hole with a total reflection-eliminating layer (301, 302, 303) through which incident light is processed to obtain emergent light capable of arriving at an interface between a packaging substrate (214) and an atmosphere at an incident angle smaller than a total reflection angle at the interface between the packaging substrate (214) and the atmosphere; and
forming an organic light emitting layer (211) and a second electrode (212) of the organic light emitting unit (210, 211, 212) above the first electrode (210), **characterised in that** the total reflection-eliminating layer (301, 302, 303) comprises a first light-processing layer (301) being of a thickness larger than an organic light emitting layer (211) of the organic light emitting unit, and a refractive index smaller than the pixel defining layer (213), and **in that**
the total reflection-eliminating layer (301, 302, 303) further comprises at least one second light-processing layer (302, 303), laminated on the first light-processing layer (301), and being of a refractive index larger than the first light-processing layer (301).

Patentansprüche

1. Organische Leuchtdioden (*Organic Light Emitting Diode,* OLED)-Anzeigetafel, umfassend:

ein Basissubstrat (201); und
eine organische lichtemittierende Einheit (210, 211, 212), eine pixeldefinierende Schicht (213) und ein Packaging-Substrat (214), die auf dem Basissubstrat (201) angeordnet sind,
wobei die pixeldefinierende Schicht (213) auf mindestens einer Seite der organischen lichtemittierenden Einheit (210, 211, 212) mit einem Durchgangsloch versehen ist,
das Durchgangsloch mit einer Totalreflexions-Unterdrückungsschicht (301, 302, 303) gefüllt ist, durch die einfallendes Licht verarbeitet wird, um austretendes Licht zu erhalten, das in der Lage ist, an einer Grenzfläche zwischen dem Packaging-Substrat und einer Atmosphäre in einem Einfallswinkel anzukommen, der kleiner als ein Totalreflexionswinkel an der Grenzfläche zwischen dem Packaging-Substrat und der Atmosphäre ist,
dadurch gekennzeichnet, dass
die Totalreflexions-Unterdrückungsschicht (301, 302, 303) eine erste Lichtverarbeitungsschicht (301) umfasst, die eine größere Dicke aufweist als eine organische lichtemittierende Schicht (211) der organischen lichtemittierenden Einheit (210, 211, 212) und einen kleineren Brechungsindex besitzt als die pixeldefinierende Schicht (213), und dass die Totalreflexions-Unterdrückungsschicht (301, 302, 303) des Weiteren mindestens eine zweite Lichtverarbeitungsschicht (302, 303) umfasst, die auf die erste Lichtverarbeitungsschicht (301) laminiert ist und einen größeren Brechungsindex besitzt als die erste Lichtverarbeitungsschicht (301).

2. OLED-Anzeigetafel nach Anspruch 1, wobei die erste Lichtverarbeitungsschicht (301) aus Magnesiumfluorid, Siliziumdioxid oder Aluminiumfluorid ist.

3. OLED-Anzeigetafel nach Anspruch 1 oder 2, wobei die Totalreflexions-Unterdrückungsschicht (301, 302, 303) mindestens zwei zweite Lichtverarbeitungsschichten (302, 303) umfasst, die nacheinander auf die erste Lichtverarbeitungsschicht (301) laminiert sind und deren Brechungsindizes nacheinander in einer Richtung von der ersten Lichtverarbeitungsschicht (301) fort größer werden.

4. OLED-Anzeigetafel nach einem der Ansprüche 1 bis 3, wobei die zweite Lichtverarbeitungsschicht (302, 303) aus Yttriumoxid, Magnesiumoxid, Zirkoniumoxid, Zinksulfid, Zinkselenid oder Titandioxid ist.

5. OLED-Anzeigetafel nach einem der Ansprüche 1 bis 4, wobei die pixeldefinierende Schicht (213) auf beiden Seiten der organischen lichtemittierenden Einheit mit Durchgangslöchern versehen ist und die Durchgangslöcher mit der Totalreflexions-Unterdrückungsschicht gefüllt sind.

6. OLED-Anzeigetafel nach einem der Ansprüche 1 bis 5, wobei die organische lichtemittierende Einheit (210, 211, 212) eine erste Elektrode (210), die organische lichtemittierende Schicht (211) und eine zweite Elektrode (212) umfasst.

7. OLED-Anzeigetafel nach Anspruch 6, wobei die erste Elektrode (210) als eine Anode ausgebildet ist und die zweite Elektrode (212) als eine Kathode ausgebildet ist.

8. Organische Leuchtdioden (*Organic Light Emitting Diode,* OLED)-Anzeigevorrichtung, umfassend die OLED-Anzeigetafel nach einem der Ansprüche 1 bis 7.

9. Verfahren zur Herstellung einer organischen Leuchtdioden (*Organic Light Emitting Diode,* OLED)-Anzei-

getafel, umfassend folgende Schritte:

Bereitstellung eines Basissubstrats (201);
Bilden einer ersten Elektrode (210) einer organischen lichtemittierenden Einheit (210, 211, 212) und einer pixeldefinierenden Schicht (213) auf dem Basissubstrat (201) ;
Bilden eines Durchgangslochs in der pixeldefinierenden Schicht (213) auf mindestens einer Seite der organischen lichtemittierenden Einheit (210, 211, 212);
Füllen des Durchgangslochs mit einer Totalreflexions-Unterdrückungsschicht (301, 302, 303), durch die einfallendes Licht verarbeitet wird, um austretendes Licht zu erhalten, das in der Lage ist, an einer Grenzfläche zwischen einem Packaging-Substrat und einer Atmosphäre in einem Einfallswinkel anzukommen, der kleiner als ein Totalreflexionswinkel an der Grenzfläche zwischen dem Packaging-Substrat und der Atmosphäre ist; und
Bilden einer organischen lichtemittierenden Schicht (211) und einer zweiten Elektrode (212) der organischen lichtemittierenden Einheit (210, 211, 212) über der ersten Elektrode (210),
dadurch gekennzeichnet, dass
die Totalreflexions-Unterdrückungsschicht (301, 302, 303) eine erste Lichtverarbeitungsschicht (301) umfasst, die eine größere Dicke aufweist als eine organische lichtemittierende Schicht (211) der organischen lichtemittierenden Einheit und einen kleineren Brechungsindex besitzt als die pixeldefinierende Schicht (213), und dass
die Totalreflexions-Unterdrückungsschicht (301, 302, 303) des Weiteren mindestens eine zweite Lichtverarbeitungsschicht (302, 303) umfasst, die auf die erste Lichtverarbeitungsschicht (301) laminiert ist und einen größeren Brechungsindex besitzt als die erste Lichtverarbeitungsschicht (301).

Revendications

1. Panneau d'affichage à diodes électroluminescentes organiques (OLED), comprenant :

un substrat de base (201) ; et
une unité électroluminescente organique (210, 211, 212), une couche de définition de pixel (213), et un substrat d'encapsulation (214) disposé sur le substrat de base (201), dans lequel la couche de définition de pixel (213) est pourvue d'un trou de raccordement au moins d'un côté de l'unité électroluminescente organique (210, 211, 212),
le trou de raccordement est rempli d'une couche d'élimination de réflexion totale (301, 302, 303) à travers laquelle la lumière incidente est traitée pour obtenir une lumière émergente apte à atteindre une interface entre le substrat d'encapsulation et une atmosphère, selon un angle d'incidence inférieur à un angle de réflexion totale à l'interface entre le substrat d'encapsulation et l'atmosphère,
caractérisé en ce que :
la couche d'élimination de réflexion totale (301, 302, 303) comprend une première couche de traitement de la lumière (301) ayant une épaisseur supérieure à celle d'une couche électroluminescente organique (211) de l'unité électroluminescente organique (210, 211, 212) et un indice de réfraction inférieur à celui de la couche de définition de pixel (213), et **en ce que** :
la couche d'élimination de réflexion totale (301, 302, 303) comprend en outre au moins une seconde couche de traitement de la lumière (302, 303), stratifiée sur la première couche de traitement de la lumière (301), et ayant un indice de réfraction supérieur à celui de la première couche de traitement de la lumière (301).

2. Panneau d'affichage à diodes OLED, selon la revendication 1, dans lequel la première couche de traitement de la lumière (301) est constituée de fluorure de magnésium, de dioxyde de silicium ou de fluorure d'aluminium.

3. Panneau d'affichage à diodes OLED, selon la revendication 1 ou 2, dans lequel la couche d'élimination de réflexion totale (301, 302, 303) comprend au moins deux secondes couches de traitement de la lumière (302, 303) stratifiées successivement sur la première couche de traitement de la lumière (301), et ayant des indices de réfraction augmentant successivement dans une direction opposée à la première couche de traitement de la lumière (301).

4. Panneau d'affichage à diodes OLED, selon l'une quelconque des revendications 1 à 3, dans lequel la seconde couche de traitement de la lumière (302, 303) est constituée d'oxyde d'yttrium, d'oxyde de magnésium, d'oxyde de zirconium, de sulfure de zinc, de séléniure de zinc ou de dioxyde de titane.

5. Panneau d'affichage à diodes OLED, selon l'une quelconque des revendications 1 à 4, dans lequel la couche de définition de pixel (213) est pourvue de trous de raccordement des deux côtés de l'unité électroluminescente organique, et les trous de raccordement sont remplis de la couche d'élimination de réflexion totale.

6. Panneau d'affichage à diodes OLED, selon l'une quelconque des revendications 1 à 5, dans lequel

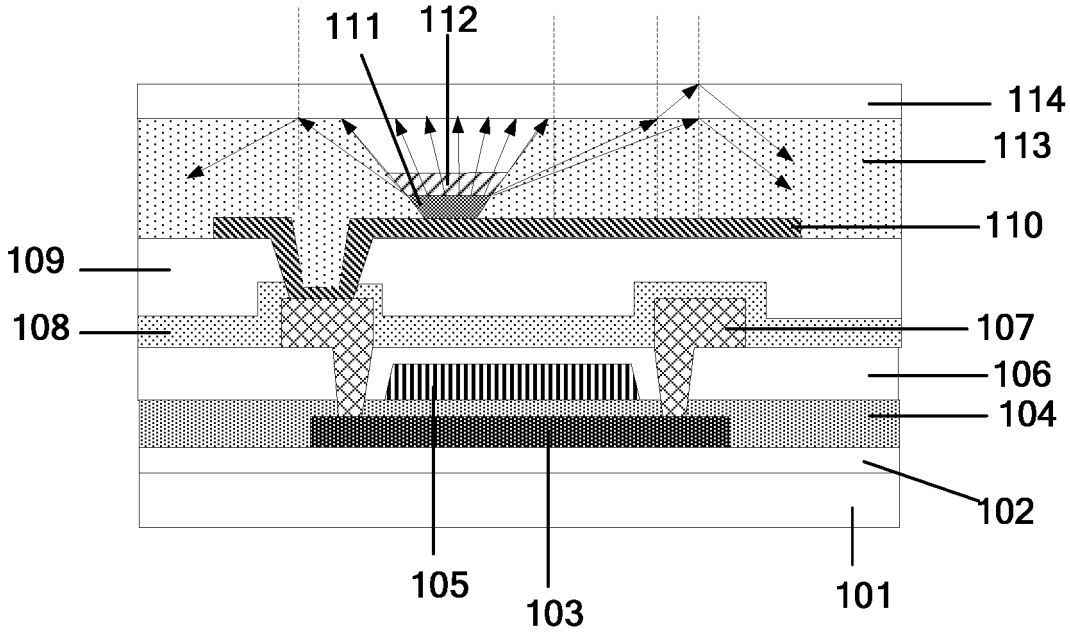
l'unité électroluminescente organique (210, 211, 212) comprend : une première électrode (210), la couche électroluminescente organique (211) et une seconde électrode (212).

7. Panneau d'affichage à diodes OLED, selon la revendication 6, dans lequel la première électrode (210) est conçue comme une anode, et la seconde électrode (212) est conçue comme une cathode.

8. Dispositif d'affichage à diodes électroluminescentes organiques (OLED), comprenant le panneau d'affichage à diodes OLED, selon l'une quelconque des revendications 1 à 7.

9. Procédé de fabrication d'un panneau d'affichage à diodes électroluminescentes organiques (OLED), comprenant les étapes consistant à :

se procurer un substrat de base (201) ;
former une première électrode (210) d'unité électroluminescente organique (210, 211, 212) et une couche de définition de pixel (213) sur le substrat de base (201) ;
former un trou de raccordement dans la couche de définition de pixel (213) au moins d'un côté de l'unité électroluminescente organique (210, 211, 212) ;
remplir le trou de raccordement d'une couche d'élimination de réflexion totale (301, 302, 303) à travers laquelle la lumière incidente est traitée pour obtenir une lumière émergente apte à atteindre une interface entre un substrat d'encapsulation (214) et une atmosphère selon un angle d'incidence inférieur à un angle de réflexion totale à l'interface entre le substrat d'encapsulation (214) et l'atmosphère ; et
former une couche électroluminescente organique (211) et une seconde électrode (212) de l'unité électroluminescente organique (210, 211, 212) au-dessus de la première électrode (210),
caractérisé en ce que :
la couche d'élimination de réflexion totale (301, 302, 303) comprend une première couche de traitement de la lumière (301) ayant une épaisseur supérieure à celle d'une couche électroluminescente organique (211) de l'unité électroluminescente organique, et un indice de réfraction inférieur à celui de la couche de définition de pixel (213), et **en ce que** :
la couche d'élimination de réflexion totale (301, 302, 303) comprend en outre au moins une seconde couche de traitement de la lumière (302, 303), stratifiée sur la première couche de traitement de la lumière (301), et ayant un indice de réfraction supérieur à celui de la première couche de traitement de la lumière (301).


111
112
114
113
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101

Fig.1

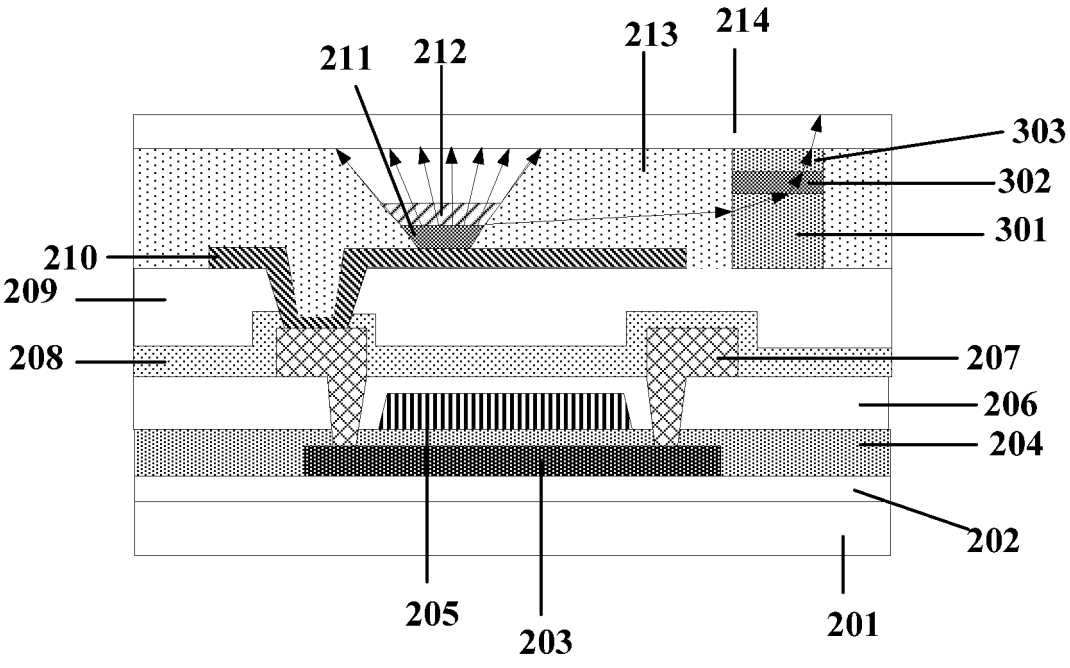
211
212
213
214
303
302
301
210
209
208
207
206
204
202
205
203
201

Fig.2

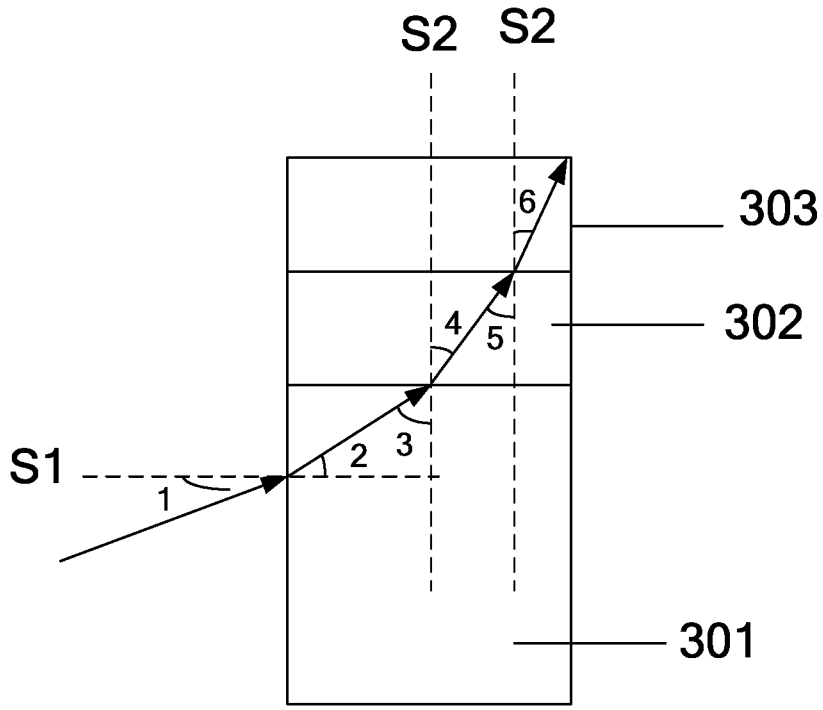

Fig.3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2014183472 A1 **[0003]**
- JP 2009176495 A **[0004]**
- WO 2013186916 A1 **[0005]**

专利名称(译)	带有有机发光二极管的记分牌，其制造工艺和显示装置		
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当前申请(专利权)人(译)	京东方科技集团股份有限公司.		
[标]发明人	XU XIAOWEI SHI LEI XU WENQING		
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其他公开文献	EP3190623A4 EP3190623A1		
外部链接	Espacenet		

摘要(译)

提供了一种OLED显示面板及其制造方法以及显示装置。 OLED显示面板包括：基底基板； 有机发光单元，像素限定层和封装基板布置在基础基板上。 像素限定层在有机发光单元的至少一侧处设置有通孔。 所述通孔填充有全反射消除层，通过该全反射消除层处理入射光以获得能够以小于入射角的全反射角的入射角到达封装基板与大气之间的界面的出射光。 包装基材和大气。

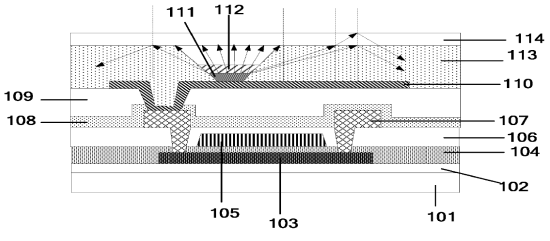

Fig.1

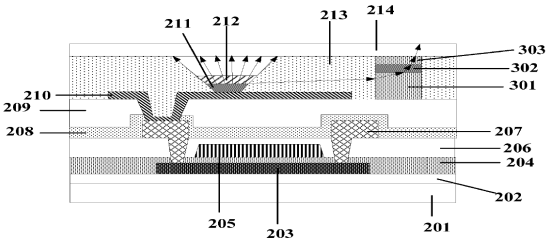

Fig.2