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(54) ELECTROLUMINESCENT DISPLAY AND DISPLAY DEVICE

ELEKTROLUMINESZENTE ANZEIGE UND ANZEIGEVORRICHTUNG

AFFICHAGE ÉLECTROLUMINESCENT ET DISPOSITIF D'AFFICHAGE

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- **None**

Description

FIELD

[0001] The present invention relates to the field of display technologies, and in particular to an electroluminescent display and a display device.

BACKGROUND

[0002] At present, organic electroluminescent displays (also indicated as OLED hereinafter) have gradually become the mainstream for the display field because of their excellent performances such as low power consumption, high color saturation, wide view angle, thin thickness and the flexibility. The full color display of an OLED display is generally achieved by means of independent light emission by red (R), green (G) and blue (B) subpixels or combined light emission by a white OLED and a color filter. In this case, independent light emission by red (R), green (G) and blue (B) subpixels is the most frequently adopted color mode for an OLED display currently, which achieves independent light emission by means of organic luminescent materials in the RGB subpixels.

[0003] As shown in Fig. 1, a basic structure for an OLED display which emits light independently by means of organic luminescent materials in the RGB subpixels comprises a base substrate 001, as well as an anode 002, a light-emitting layer 003 and a cathode 004 arranged on the base substrate 001 sequentially, wherein the light-emitting layer 003 consists of a red organic luminescent material, a green organic luminescent material and a blue organic luminescent material disposed in parallel and circular arrangement. The light-emitting principle is that when a voltage is applied to the anode 002 and the cathode 004 respectively to form a current, electrons in the cathode 004 and holes in the anode 002 will be combined to form excitons in the light-emitting layer 003, which excite the organic luminescent materials in the light-emitting layer 003 to emit light. When the RGB subpixels in the OLED display are arranged in a juxtaposed manner, the technique of fine metal mask (FMM) will be mainly adopted during the preparation of the light-emitting layer 003. That is to say, when an organic luminescent material is evaporated and coated in the RGB, shielding the other two subpixels by the shielding effect of a shielding area in a mask plate, and then moving the mask plate or the base substrate by a fine alignment system to evaporate and coat the other two organic luminescent materials. However, the resolution of an OLED made in this manner is subject to the size of the mask plate for evaporation and coating.

[0004] Therefore, how to further improve the resolution of the OLED by using a new structure design without varying the size of the mask plate is an urgent technical problem to be solved by those skilled in the art.

[0005] CN 103 779 387 A discloses an organic light-emitting diode (OLED) display panel and a display device. A pixel unit of the OLED display panel includes a first sub-pixel, a second sub-pixel and a third sub-pixel and further includes an anode layer, a cathode layer and an organic function layer. The organic function layer includes a first emission layer (EML1) configured to cover at least two adjacent sub-pixels comprising the first sub-pixel; a carrier blocking layer (CBL) configured to cover the second sub-pixel and the third sub-pixel; a second emission layer (EML2) arranged at an area provided with the first sub-pixel and the second sub-pixel and configured to at least cover the second sub-pixel; and a third emission layer (EML3) configured to cover at least two adjacent sub-pixels comprising the third sub-pixel. The OLED display panel can improve the pixel density.

[0006] WO 2009/154288 A1 discloses a stack type organic electroluminescence display apparatus which can be structured to be an active matrix type. The organic electroluminescence display apparatus of the active-matrix driving system includes: a display region having a plurality of pixels each of which includes at least two subpixels, wherein the subpixels have three or more light-emitting devices stacked thereon each of which is configured by sandwiching between electrodes an organic layer including an emission layer, and any of the emission layers emits a light of different colors from each other and is commonly formed in all pixels; and a circuit for applying voltage to between the electrodes of the light-emitting device, wherein at least one light-emitting device among the stacked light-emitting devices is nonemission-treated.

[0007] US 2010/0090241 A1 discloses an organic light emitting device. The device includes an anode, a cathode, and an organic emissive stack disposed between the anode and the cathode. The device may be a "pixel" in a display, capable of emitting a wide variety of colors through the use of independently addressable "sub-pixels," each subpixel emitting a different spectrum of light. In the most general sense, the device includes a first subpixel and a second subpixel, and at least one of the anode and the cathode has independently addressable first and second regions corresponding to the first and second subpixels. The device includes an emissive stack disposed between the anode and the cathode. The emissive stack includes a first organic emissive layer and a second organic emissive layer. The first organic emissive layer is disposed between the anode and the cathode, and extends throughout the first and second regions. The second organic emissive layer is disposed between the anode and the cathode, and extends throughout the second region but not the first region. The second organic emissive layer is disposed closer to the cathode than the first organic emissive layer. The first organic emissive layer is emissive in the first region, and the second organic emissive layer is emissive in the second region.

SUMMARY

[0008] In this regard, the embodiments of the present invention provide an electroluminescent display and a display device, whereby the resolution of the display can be improved.

[0009] Accordingly, an embodiment of the present invention provides an electroluminescent display as recited in claim 1.

[0010] According to a possible implementation, in the electroluminescent display provided by an embodiment of the present invention, each of the luminescent material layers in a same one of the pixel units is made of a different material, and each of the subpixel units in a same one of the pixel units emits light of a different color.

[0011] According to a possible implementation, in the electroluminescent display provided by an embodiment of the present invention, each of the subpixel units comprises a first electrode, at least one luminescent material layer, and a second electrode arranged on the base substrate sequentially. The first electrode specifically comprises a reflective layer arranged on the base substrate and a transparent electrode located over the reflective layer.

[0012] According to a possible implementation, in the electroluminescent display provided by an embodiment of the present invention, in a same one of the pixel units, at least one of the subpixel units has a micro cavity length different from that of another one of the subpixel units, the micro cavity length being a length from a side of the reflective layer away from the base substrate to a side of the second electrode away from the base substrate.

[0013] According to a possible implementation, in the electroluminescent display provided by an embodiment of the present invention, in a same one of the pixel units, each of the subpixel units has a different micro cavity length.

[0014] According to a possible implementation, in the electroluminescent display provided by an embodiment of the present invention, in a same one of the pixel units, the transparent electrode corresponding to each of the subpixel units has a different thickness.

[0015] According to a possible implementation, in the electroluminescent display provided by an embodiment of the present invention, each of the pixel units further comprises a hole transport layer arranged between the first electrode and the luminescent material layer, and/or an electron transport layer arranged between the second electrode and the luminescent material layer.

[0016] An embodiment of the present invention further provides a display device comprising the electroluminescent display provided by an embodiment of the present invention.

[0017] The embodiments of the present invention provide an electroluminescent display and a display device comprising the same. The electroluminescent display comprises a base substrate and a plurality of pixel units arranged in arrays on the base substrate. Each pixel unit is composed of at least four subpixel units, and each pixel unit comprises at least three luminescent material layers. Each luminescent material layer at least covers two adjacent subpixel units, and only one luminescent material layer in each subpixel unit emits light. Since each luminescent material layer at least covers two adjacent subpixel units, when a luminescent material is evaporated and coated by an evaporation coating process, the subpixel units can be made smaller with the size of the mask plate unchanged, which is helpful for improving the resolution of the display.

BRIEF DESCRIPTION OF DRAWINGS

[0018]

Fig. 1 is a schematic structural view of an electroluminescent display in the prior art;

Figs. 2a to 2c are respective schematic structural views of an electroluminescent display not falling within the scope of the invention; Figs. 2d to 2f are respectively schematic structural views of an electroluminescent display provided by embodiments of the present invention; and

Figs. 3a to 3f are respectively schematic structural views of an electroluminescent display as shown in Fig. 2f after executing each step of a method for manufacturing the same.

DETAILED DESCRIPTION OF EMBODIMENTS

[0019] Specific embodiments of the electroluminescent display and the display device provided by the embodiments of the present invention will be explained in details with reference to the drawings.

[0020] In the following description and drawings, the thickness and shape of each layer do not reflect the real scale of the electroluminescent display, but only for the purpose of schematically illustrating contents of the invention.

[0021] An embodiment not forming part of of the present invention provides an electroluminescent display as shown in Figs. 2a-2c, comprising a base substrate 100 and a plurality of pixel units arranged in arrays on the base substrate 100. Each of the pixel units is composed of at least four subpixel units, and each of the pixel units comprises at least three luminescent material layers 300. Each of the luminescent material layers 300 at least covers two adjacent subpixel units, and only one of the luminescent material layers 300 in each of the subpixel units emits light.

[0022] In the electroluminescent display provided, since each of the luminescent material layers at least covers two adjacent subpixel units, when a luminescent material is evaporated and coated by an evaporation coating process, the subpixel units can be made smaller with the size of the mask plate unchanged, which is helpful for improving the resolution of the display.

[0023] Specifically, as an example, as shown in Figs. 2a and 2b, each pixel unit is composed of four subpixel units, and each pixel unit comprises three luminescent material layers, namely a first luminescent material layer 301, a second luminescent material layer 302 and a third luminescent material layer 303, each luminescent material layer covering two adjacent subpixel units. Fig. 2a and Fig. 2b differ from each other in the arrangement manner for the three luminescent material layers. As shown in Fig. 2c, each pixel unit is composed of five subpixel units, and each pixel unit comprises three luminescent material layers, namely a first luminescent material layer 301, a second luminescent material layer 302 and a third luminescent material layer 303. The first luminescent material layer 301 covers three adjacent subpixel units in the middle, and the second luminescent material layer 302 and the third luminescent material layer 303 cover the two left-most adjacent subpixel units or the two rightmost adjacent subpixel units respectively. Here, three schematic structural views of the above electroluminescent display are listed for simplicity.

[0024] According to a specific implementation, in order to improve the color gamut of the display, each luminescent material layer in a same pixel unit can be made of a different material. Since the materials themselves have different properties and they can play a decisive role in the color of light emitted by each subpixel unit in combination with the setting for the micro cavity length, light emitted by each subpixel unit in a same pixel unit can have a different color. Specifically, as an example, as shown in Figs. 2a and 2b, in a same pixel unit, the material for the first luminescent material layer 301 can be a yellow organic luminescent material, and the materials for the second luminescent material layer 302 and the third luminescent material layer 303 can be a dark blue organic luminescent material or a light blue organic luminescent material respectively. In this case, colors of light emitted by each subpixel unit may be respectively dark blue, green, red and light blue from left to right, and a four-pixel type OLED display is realized. As shown in Fig. 2c, in a same pixel, the material for the first luminescent material layer 301 can be a yellow organic luminescent material, and the materials for the second luminescent material layer 302 and the third luminescent material layer 303 can be a dark blue organic luminescent material or a light blue organic luminescent material respectively. In this case, colors of light emitted by each subpixel unit may be respectively dark blue, green, yellow, red and light blue from left to right, and a five-pixel type OLED display is realized. The four-pixel type OLED display and the five-pixel type OLED display realized in the present invention have special advantages such as longer service lifetime, lower power consumption and higher color gamut over a three-pixel type OLED display.

[0025] According to a specific implementation, as shown in Figs. 2a-2c, each subpixel unit comprises a first electrode 200, at least one luminescent material layer 300, and a second electrode 400 arranged on the base substrate 100 sequentially. The first electrode 200 specifically comprises a reflective layer 201 arranged on the base substrate 100 and a transparent electrode 202 located over the reflective layer 201. It should be noted that the drawings are only for the purpose of schematic illustration, and in the manufacturing process, the luminescent material layer is formed directly on a transparent electrode pattern, so that there is no gap between the transparent electrode and the luminescent material layer. As a specific example shown in Fig. 2a, in the evaporation coating process, the second luminescent material layer 302 is formed directly on the transparent electrode 202, so that after the evaporation coating process, there should be no gap between the second luminescent material layer 302 and the transparent electrode 202.

[0026] According to a specific implementation, in the electroluminescent display provided by an embodiment of the present invention, in a same pixel unit, the micro cavity length of at least one subpixel unit can be arranged to be different from that of another subpixel unit. The micro cavity length here is specifically a length from a side of the reflective layer 201 away from the base substrate 100 to a side of the second electrode 400 away from the base substrate 100. With adjustment for the micro cavity length of each subpixel unit, when the same luminescent material layer is used for emitting light and at least two subpixel units covered by this luminescent material layer have different micro cavity lengths, the at least two subpixel units covered thereby will emit light of different colors. The reason for this is that the longer the micro cavity length is, the greater the wavelength of the exit light will be. Specifically, as shown in Fig. 2a, which does not represent an embodiment of the invention, when the first luminescent material layer 301 is used to emit light and the second subpixel unit and the third subpixel unit covered by this first luminescent material layer 301 have different micro cavity lengths, the second subpixel unit and the third subpixel unit will emit light of different colors. It should be noted that the first subpixel unit and the fourth subpixel unit may have the same micro cavity length or different micro cavity lengths, which will not be limited here. When the first subpixel unit and the fourth subpixel unit have the same micro cavity length, the colors of light emitted by the first subpixel unit and the fourth subpixel unit will be determined by the color of the organic luminescent materials themselves.

[0027] According to a specific implementation, in the electroluminescent display provided by an embodiment of the present invention, in order to further ensure that each subpixel unit emits light of a different color in a same pixel unit, specifically, in the same pixel unit, the micro cavity length of each subpixel unit can be arranged to be different.

[0028] According to a specific implementation, in the electroluminescent display as shown in Fig. 2a, since the thickness of the transparent electrode determines the micro cavity length, the micro cavity length can be adjusted by means of the thickness of the transparent electrode, in order that the micro cavity length of each subpixel unit is different in a same pixel unit. In the same pixel unit, the thickness of the transparent electrode 202 corresponding to each subpixel unit can be arranged to be different.

[0029] According to a specific implementation, in the electroluminescent display as shown in Fig. 2a, each pixel unit is composed of four subpixel units. Each pixel unit specifically comprises a first luminescent material layer 301 covering a second subpixel unit and a third subpixel unit, a second luminescent material layer 302 covering a first subpixel unit and a second subpixel unit, and a third luminescent material layer 303 covering a third subpixel unit and a fourth subpixel unit. In the second subpixel unit and the third subpixel unit, only the first luminescent material layer 301 can emit light. According to a specific implementation, in the electroluminescent display as shown in Fig 2a, both the second luminescent material layer 302 and the third luminescent material layer 303 can be located above or below the first luminescent material layer 301. It should be noted that the positional relationship of the second luminescent material layer 302 and the third luminescent material layer 303 relative to the first luminescent material layer 301 can also be otherwise. As shown in Fig. 2b, the second luminescent material layer 302, the first luminescent material layer 301 and the third luminescent material layer 303 superpose each other. There can be many different ways for arranging each luminescent material layer, which can be selected upon a specific situation, so no limitation will be made here.

[0030] According to the invention, as shown in Fig. 2d, a carrier or exciton blocking layer 500 is arranged between the first luminescent material layer 301 and the second luminescent material layer 302 as well as between the first luminescent material layer 301 and the third luminescent material layer 303, such that holes can be prevented from transferring to the second luminescent material layer 302 and the third luminescent material layer 303, while electrons can pass through the carrier or exciton blocking layer 500 and transfer to the first luminescent material layer 301. As a result, the electrons and the holes staying in the first luminescent material layer 301 form excitons, which excite the first luminescent material layer 301 to emit light. It should be noted that the first luminescent material layer 301 in Fig. 2d is arranged below the second luminescent material layer 302 and the third luminescent material layer 303. Also according to the invention, as shown in Fig. 2e, the first luminescent material layer 301 can also be arranged above the second luminescent material layer 302 and the third luminescent material layer 303 which belong to a same layer. In this case, the exciton blocking layer prevents the electrons from transferring to the second luminescent material layer 302 and the third luminescent material layer 303, while the holes can pass through the carrier or exciton blocking layer 500 and transfer to the first luminescent material layer 301. As a result, the holes and the electrons staying in the first luminescent material layer 301 form excitons, which excite the first luminescent material layer 301 to emit light. These two ways for arrangement are both applicable, and no limitation will be made here.

[0031] Specifically, as shown in Figs. 2d and 2e, when the material for the first luminescent material layer 301 is a yellow organic luminescent material, in combination with the setting for the micro cavity length, the colors of light emitted by the second subpixel unit and the third subpixel unit can be green and red respectively. It should be noted, when the materials for the second luminescent material layer 302 and the third luminescent material layer 303 are a dark blue organic luminescent material or a light blue organic luminescent material respectively, this may cause each pixel unit to emit light of four colors, namely dark blue, green, red and light blue, thereby realizing a four-pixel type OLED display. When the materials for the second luminescent material layer 302 and the third luminescent material layer 303 are a blue organic luminescent material or green organic luminescent material respectively, this may cause each pixel unit to emit light of three colors, namely blue, green and red, thereby realizing a three-pixel type OLED display.

[0032] According to a specific implementation, in the electroluminescent display provided by an embodiment of the present invention, as shown in Fig. 2f, in order to improve the luminous efficiency of the display effectively, each pixel unit further comprises a hole transport layer 600 arranged between the first electrode 200 and the luminescent material layer 300, and/or an electron transport layer 700 arranged between the second electrode 400 and the luminescent material layer 300.

[0033] A method for manufacturing the electroluminescent display will be explained in details as follows in a specific example, which specifically comprises the following steps:

1. Forming a reflective layer and a transparent electrode on a base substrate sequentially
Specifically, as shown in Fig. 3a, the reflective layer 201 and the transparent electrode 202 are formed sequentially on the base substrate 100 by a patterning process. In a same pixel unit, the transparent electrode 202 corresponding to each of the four subpixel units has a different thickness.
2. Forming a hole transport layer on the base substrate on which the transparent electrode has been formed
Specifically, as shown in Fig. 3b, a hole transport layer 600 is formed on the base substrate 100 by a pattering process on which the transparent electrode 202 has been formed.
3. Forming a first luminescent material layer on the formed hole transport layer
Specifically, as shown in Fig. 3c, the first luminescent material layer 301 is formed on the formed hole transport layer 600 by a patterning process. The first lu-

minescent material layer covers the second subpixel unit and the third subpixel unit.

4. Forming an exciton blocking layer on the first luminescent material layer

Specifically, as shown in Fig. 3d, the exciton blocking layer 500 is formed on the first luminescent material layer 301 by a patterning process. A pattern of the exciton blocking layer 500 is the same as that of the first luminescent material layer 301.

5. Forming a second luminescent material layer and a third luminescent material layer on the exciton blocking layer

Specifically, as shown in Fig. 3e, the second luminescent material layer 302 and the third luminescent material layer 303 are formed on the exciton blocking layer 500 by an evaporation coating process. The second luminescent material layer 302 covers the first subpixel unit and the second subpixel unit, and the third luminescent material layer 303 covers the third subpixel unit and the fourth subpixel unit.

6. Forming an electron transport layer and a cathode sequentially on the second luminescent material layer and the third luminescent material layer

Specifically, as shown in Fig. 3f, the electron transport layer 700 and the cathode 400 are formed sequentially on the second luminescent material layer 302 and the third luminescent material layer 303 by a patterning process.

[0034] So far, the electroluminescent display provided is manufactured through the above steps 1-6 provided in the specific example.

[0035] Based on the same inventive concept, an embodiment of the present invention further provides a display device comprising the electroluminescent display provided by an embodiment of the present invention. The display device can be any product or component having a display function, such as a handset, a tablet computer, a television, a display, a notebook computer, a digital photo frame, a navigator and the like. Other essential components necessary for the display device are those which are considered as necessary by those having ordinary skills in the art, which will not be described here for simplicity and should not be taken as a limitation to the present invention. As for the implementation of the display device, the embodiments of the electroluminescent display can be referred to, and the repeated portions will not be described again for simplicity.

[0036] The embodiments of the present invention provide an electroluminescent display and a display device comprising the same. The electroluminescent display comprises a base substrate and a plurality of pixel units arranged in arrays on the base substrate, each pixel unit being composed of at least four subpixel units and each pixel unit comprising at least three luminescent material layers. Each luminescent material layer at least covers two adjacent subpixel units, and only one luminescent material layer in each subpixel unit emits light. Since each luminescent material layer at least covers two adjacent subpixel units, when a luminescent material is evaporated and coated by an evaporation coating process, the subpixel units can be made smaller with the size of the mask plate unchanged, which is helpful for improving the resolution of the display.

[0037] Obviously, those skilled in the art can make various modifications and transformations to the present invention without deviating from the scope of the present invention as defined by the appended claims.

Claims

1. An electroluminescent display comprising a base substrate (100) and a plurality of pixel units arranged in arrays on the base substrate (100), each of the pixel units being composed of at least four subpixel units, and each of the pixel units comprising a carrier or exciton blocking layer (500) and at least three luminescent material layers (300),

   wherein each of the luminescent material layers (300) at least covers two adjacent subpixel units, the at least four subpixel units comprise a first subpixel unit, a second subpixel unit, a third subpixel unit and a fourth subpixel unit, the at least three luminescent material layers (300) comprise a first luminescent material layer (301), a second luminescent material layer (302) and a third luminescent material layer (303), the first luminescent material layer (301) covers the second subpixel unit and the third subpixel unit, the second luminescent material layer (302) covers the first subpixel unit and the second subpixel unit, and the third luminescent material layer (303) covers the third subpixel unit and the fourth subpixel unit,

   wherein the first luminescent material layer (301) is on a side of the carrier or exciton blocking layer (500), and the second luminescent material layer (302) and the third luminescent material layer (303) are on another side of the carrier or exciton blocking layer, the carrier or exciton blocking layer (500) is arranged in a portion where the second luminescent material layer (302) and the third luminescent material layer (303) overlap the first luminescent material layer (301), only one of the luminescent material layers (300) in each of the subpixel units is configured to emit light, and only the first luminescent material layer (301) is configured to emit light in the second subpixel unit and the third subpixel unit.

2. The electroluminescent display according to claim 1, wherein each of the luminescent material layers (300) in a same one of the pixel units is made of a

different material, and
each of the subpixel units in a same one of the pixel units emits light of a different color

3. The electroluminescent display according to claim 1, wherein each of the subpixel units comprises a first electrode (200), at least one luminescent material layer (300), and a second electrode (400) arranged on the base substrate (100) sequentially, and the first electrode (200) comprises a reflective layer (201) arranged on the base substrate (100) and a transparent electrode (202) located over the reflective layer (201).

4. The electroluminescent display according to claim 3, wherein in a same one of the pixel units, at least one of the subpixel units has a micro cavity length different from that of another one of the subpixel units, the micro cavity length being a length from a side of the reflective layer (201) away from the base substrate (100) to a side of the second electrode (400) away from the base substrate (100).

5. The electroluminescent display according to claim 4, wherein in a same one of the pixel units, each of the subpixel units has a different micro cavity length.

6. The electroluminescent display according to claim 5, wherein in a same one of the pixel units, the transparent electrode (202) corresponding to each of the subpixel units has a different thickness.

7. The electroluminescent display according to any one of claims 1-6, wherein each of the pixel units further comprises a hole transport layer (600) arranged between the first electrode (200) and the luminescent material layer (300), and/or an electron transport layer (700) arranged between the second electrode (400) and the luminescent material layer (300).

8. A display device, comprising the electroluminescent display according to any one of claims 1-7.

Patentansprüche

1. Elektrolumineszierende Anzeige, umfassend ein Basissubstrat (100) und eine Mehrzahl von Pixeleinheiten, die in Arrays auf dem Basissubstrat (100) angeordnet ist, wobei jede der Pixeleinheiten aus mindestens vier Subpixeleinheiten besteht, und jede der Pixeleinheiten eine Träger- oder Exzitonensperrschicht (500) und mindestens drei Schichten aus lumineszierendem Material (300) umfasst,

wobei jede der Schichten aus lumineszierendem Material (300) mindestens zwei benachbarte Subpixeleinheiten bedeckt, die mindestens vier Subpixeleinheiten eine erste Subpixeleinheit, eine zweite Subpixeleinheit, eine dritte Subpixeleinheit und eine vierte Subpixeleinheit umfassen, die mindestens drei Schichten aus lumineszierendem Material (300) eine erste Schicht aus lumineszierendem Material (301), eine zweite Schicht aus lumineszierendem Material (302) und eine dritte Schicht aus lumineszierendem Material (303) umfassen, die erste Schicht aus lumineszierendem Material (301) die zweite Subpixeleinheit und die dritte Subpixeleinheit bedeckt, die zweite Schicht aus lumineszierendem Material (302) die erste Subpixeleinheit und die zweite Subpixeleinheit bedeckt, und die dritte Schicht aus lumineszierendem Material (303) die dritte Subpixeleinheit und die vierte Subpixeleinheit bedeckt,
wobei die erste Schicht aus lumineszierendem Material (301) auf einer Seite der Träger- oder Exzitonensperrschicht (500) ist, und die zweite Schicht aus lumineszierendem Material (302) und die dritte Schicht aus lumineszierendem Material (303) auf einer anderen Seite der Träger- oder Exzitonensperrschicht sind, wobei die Träger- oder Exzitonensperrschicht (500) in einem Abschnitt angeordnet ist, in welchem die zweite Schicht aus lumineszierendem Material (302) und die dritte Schicht aus lumineszierendem Material (303) die erste Schicht aus lumineszierendem Material (301) überlappen, wobei nur eine der Schichten aus lumineszierendem Material (300) in jeder der Subpixeleinheiten zum Emittieren von Licht ausgelegt ist, und nur die erste Schicht aus lumineszierendem Material (301) zum Emittieren von Licht in der zweiten Subpixeleinheit und der dritten Subpixeleinheit ausgelegt ist.

2. Elektrolumineszierende Anzeige nach Anspruch 1, wobei jede der Schichten aus lumineszierendem Material (300) in einer gleichen der Pixeleinheiten aus einem unterschiedlichen Material hergestellt ist, und
jede der Subpixeleinheiten in einer gleichen der Pixeleinheiten Licht einer unterschiedlichen Farbe emittiert.

3. Elektrolumineszierende Anzeige nach Anspruch 1, wobei jede der Subpixeleinheiten eine erste Elektrode (200), mindestens eine Schicht aus lumineszierendem Material (300) und eine zweite Elektrode (400) der Reihe nach auf dem Basissubstrat (100) angeordnet umfasst, und
die erste Elektrode (200) eine reflektierende Schicht (201), die auf dem Basissubstrat (100) angeordnet ist, und eine durchlässige Elektrode (202) umfasst, die sich über der reflektierenden Schicht (201) befindet.

4. Elektrolumineszierende Anzeige nach Anspruch 3, wobei in einer gleichen der Pixeleinheiten mindestens eine der Subpixeleinheiten eine Mikrovertiefungslänge aufweist, die von der einer anderen der Subpixeleinheiten verschieden ist, wobei die Mikrovertiefungslänge eine Länge von einer Seite der reflektierenden Schicht (201) entfernt vom Basissubstrat (100) zu einer Seite der zweiten Elektrode (400) entfernt vom Basissubstrat (100) ist.

5. Elektrolumineszierende Anzeige nach Anspruch 4, wobei in einer gleichen der Pixeleinheiten jede der Subpixeleinheiten eine verschiedene Mikrovertiefungslänge aufweist.

6. Elektrolumineszierende Anzeige nach Anspruch 5, wobei in einer gleichen der Pixeleinheiten die durchlässige Elektrode (202), die jeder der Subpixeleinheiten entspricht, eine unterschiedliche Dicke aufweist.

7. Elektrolumineszierende Anzeige nach einem der Ansprüche 1 bis 6, wobei jede der Pixeleinheiten ferner eine Löchertransportschicht (600), die zwischen der ersten Elektrode (200) und der Schicht aus lumineszierendem Material (300) angeordnet ist, und/oder eine Elektronentransportschicht (700) umfasst, die zwischen der zweiten Elektrode (400) und der Schicht aus lumineszierendem Material (300) angeordnet ist.

8. Anzeigevorrichtung, umfassend die elektrolumineszierende Anzeige nach einem der Ansprüche 1 bis 7.

Revendications

1. Écran électroluminescent comprenant un substrat de base (100) et une pluralité d'unités de pixel disposées en matrices sur le substrat de base (100), chacune des unités de pixel étant composée d'au moins quatre sous-unités de pixel, et chacune des unités de pixel comprenant une couche de blocage de porteurs ou d'excitons (500) et au moins trois couches de matériau luminescent (300),

   dans lequel chacune des couches de matériau luminescent (300) recouvre au moins deux sous-unités de pixel adjacentes, les au moins quatre sous-unités de pixel comprennent une première sous-unité de pixel, une deuxième sous-unité de pixel, une troisième sous-unité de pixel et une quatrième sous-unité de pixel, les au moins trois couches de matériau luminescent (300) comprennent une première couche de matériau luminescent (301), une deuxième couche de matériau luminescent (302) et une troisième couche de matériau luminescent (303), la première couche de matériau luminescent (301) recouvre la deuxième sous-unité de pixel et la troisième sous-unité de pixel, la deuxième couche de matériau luminescent (302) recouvre la première sous-unité de pixel et la deuxième sous-unité de pixel, et la troisième couche de matériau luminescent (303) recouvre la troisième sous-unité de pixel et la quatrième sous-unité de pixel,

   dans lequel la première couche de matériau luminescent (301) est sur un côté de la couche de blocage de porteurs ou d'excitons (500), et la deuxième couche de matériau luminescent (302) et la troisième couche de matériau luminescent (303) sont sur un autre côté de la couche de blocage de porteurs ou d'excitons, la couche de blocage de porteurs ou d'excitons (500) est disposée dans une portion où la deuxième couche de matériau luminescent (302) et la troisième couche de matériau luminescent (303) chevauchent la première couche de matériau luminescent (301), une seule des couches de matériau luminescent (300) dans chacune des sous-unités de pixel est configurée pour émettre de la lumière, et seule la première couche de matériau luminescent (301) est configurée pour émettre de la lumière dans la deuxième sous-unité de pixel et la troisième sous-unité de pixel.

2. Écran électroluminescent selon la revendication 1, dans lequel chacune des couches de matériau luminescent (300) dans une même des unités de pixel est constituée d'un matériau différent, et chacune des sous-unités de pixel dans une même des unités de pixel émet de la lumière d'une couleur différente.

3. Écran électroluminescent selon la revendication 1, dans lequel chacune des sous-unités de pixel comprend une première électrode (200), au moins une couche matériau luminescent (300) et une deuxième électrode (400) disposées successivement sur le substrat de base (100), et
   la première électrode (200) comprend une couche réfléchissante (201) disposée sur le substrat de base (100) et une électrode transparente (202) située pardessus la couche réfléchissante (201).

4. Écran électroluminescent selon la revendication 3 dans lequel, dans une même des unités de pixel, au moins une des sous-unités de pixel a une longueur de microcavité différente de celle d'une autre des sous-unités de pixel, la longueur de microcavité étant une longueur depuis un côté de la couche réfléchissante (201) tournant le dos au substrat de base (100) jusqu'à un côté de la deuxième électrode (400) tournant le dos au substrat de base (100).

5. Écran électroluminescent selon la revendication 4 dans lequel, dans une même des unités de pixel, chacune des sous-unités de pixel a une longueur de microcavité différente.

6. Écran électroluminescent selon la revendication 5 dans lequel, dans une même des unités de pixel, l'électrode transparente (202) correspondant à chacune des sous-unités de pixel a une épaisseur différente.

7. Écran électroluminescent selon l'une quelconque des revendications 1 à 6, dans lequel chacune des unités de pixel comprend en outre une couche de transport de trous (600) disposée entre la première électrode (200) et la couche de matériau luminescent (300), et/ou une couche de transport d'électrons (700) disposée entre la deuxième électrode (400) et la couche de matériau luminescent (300).

8. Dispositif d'affichage, comprenant l'écran électroluminescent selon l'une quelconque des revendications 1 à 7.

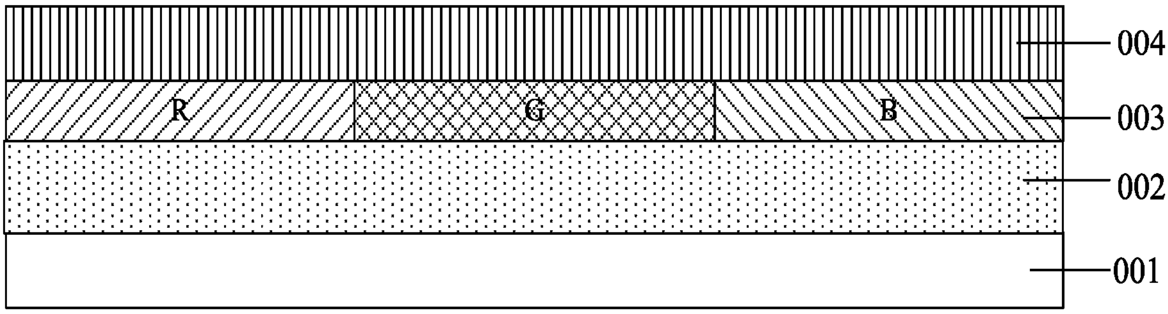

Fig. 1

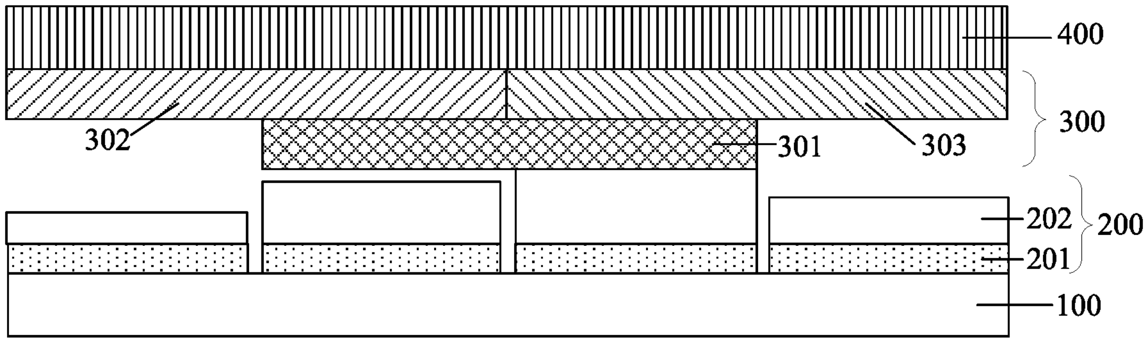

Fig. 2a

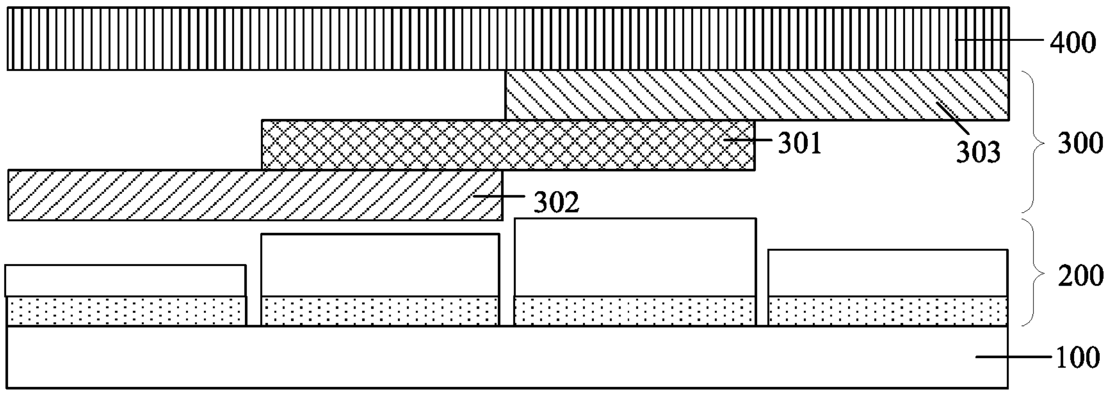

Fig. 2b

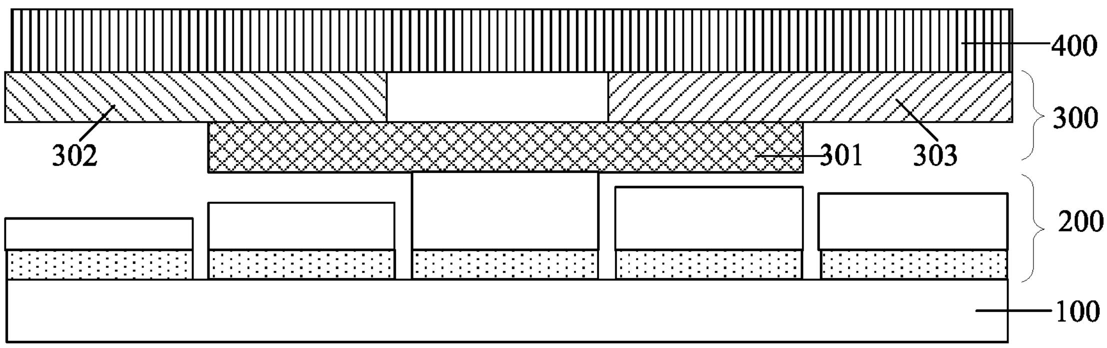

Fig. 2c

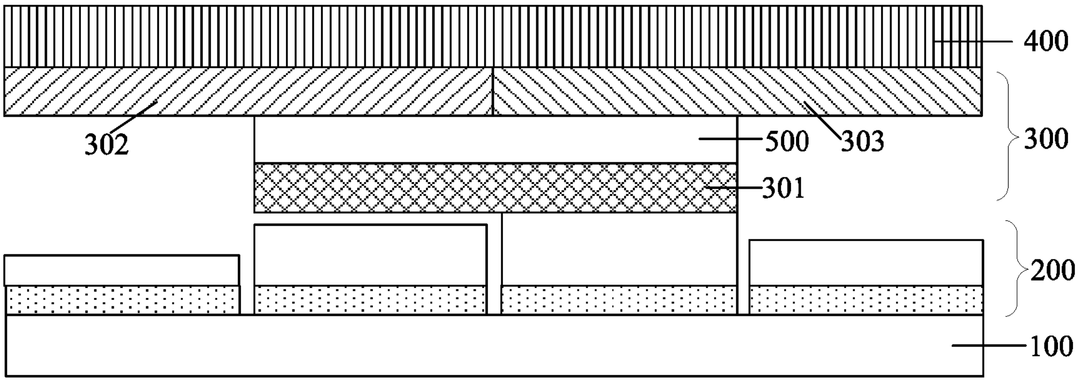

Fig. 2d

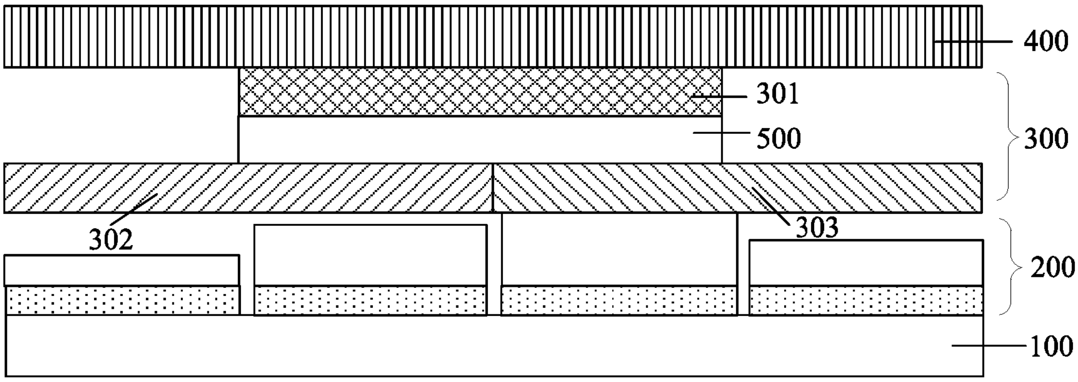

Fig. 2e

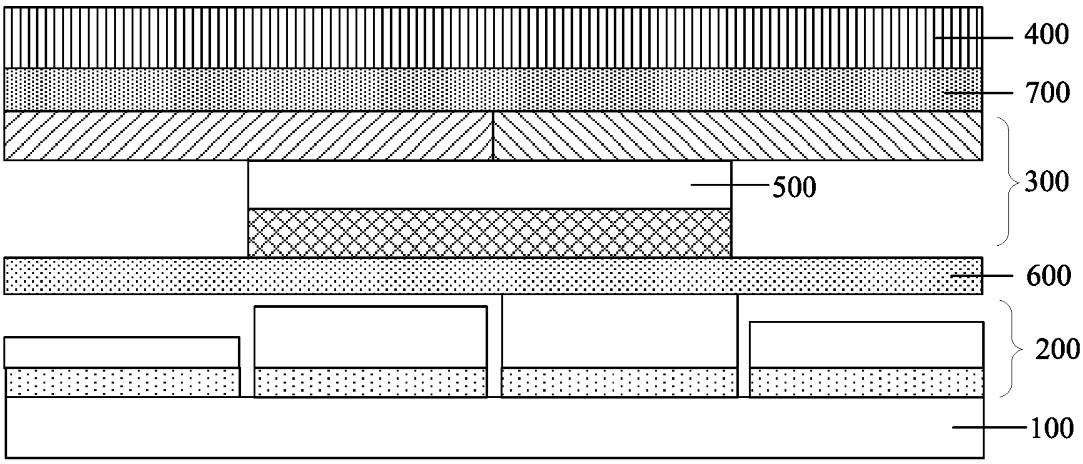

Fig. 2f

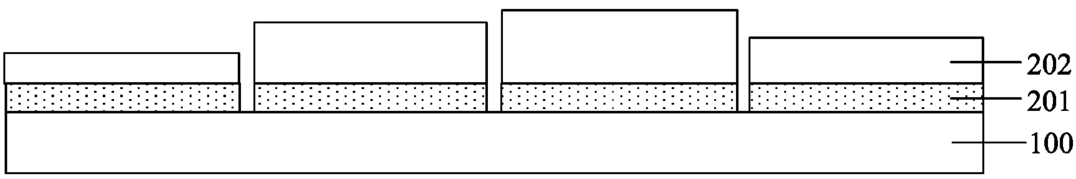

Fig. 3a

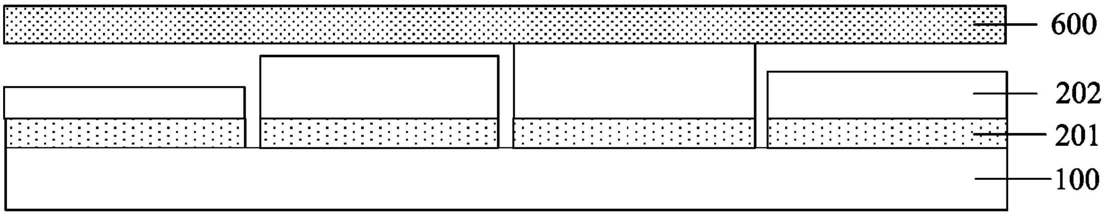

Fig. 3b

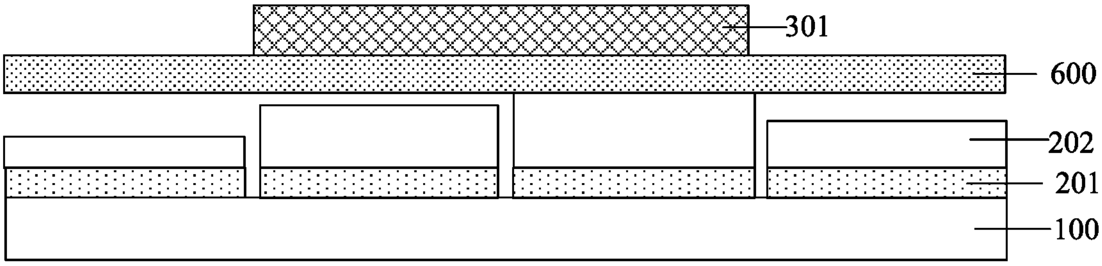

Fig. 3c

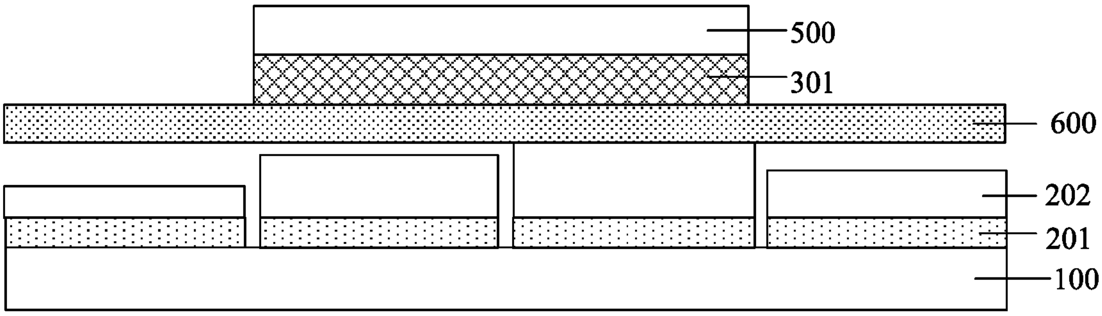

Fig. 3d

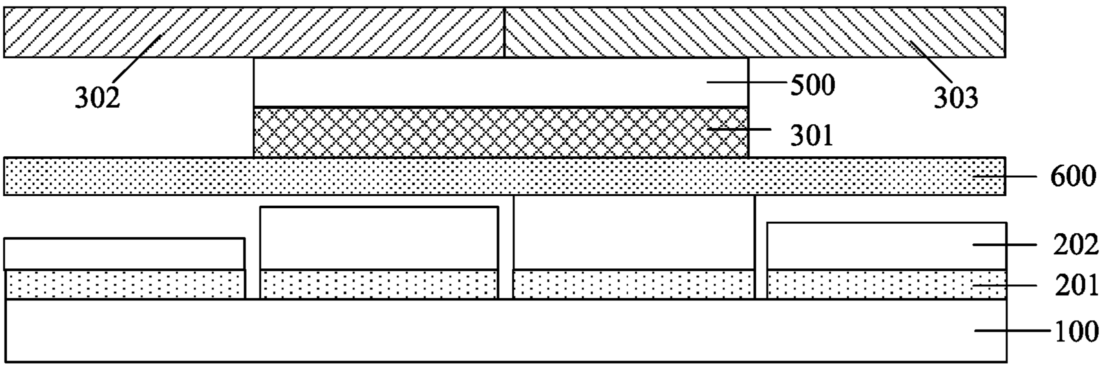

Fig. 3e

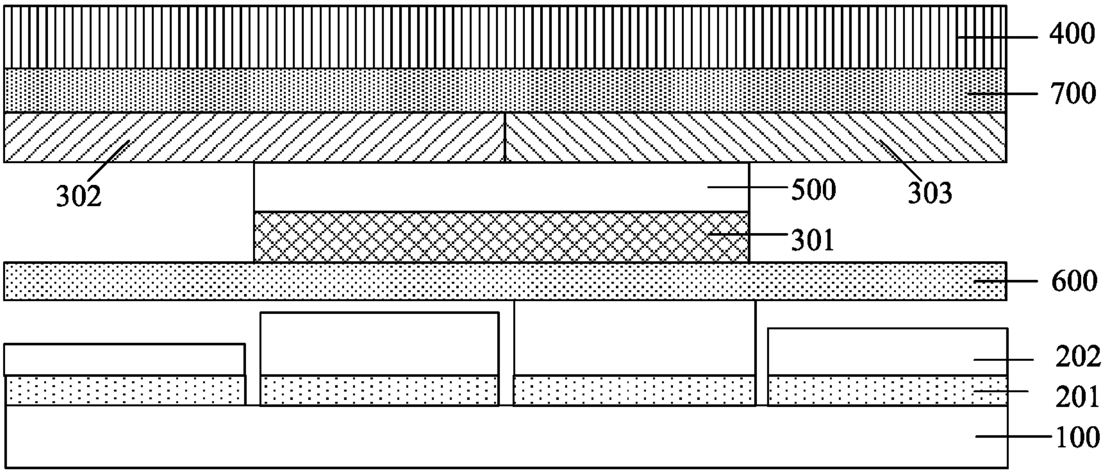

Fig. 3f

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 103779387 A **[0005]**
- WO 2009154288 A1 **[0006]**
- US 20100090241 A1 **[0007]**