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(54) **ORGANIC LIGHT EMITTING DIODE DISPLAY DEVICE**

Organische lichtemittierende Diodenanzeigevorrichtung

Affichage à diodes électroluminescentes organiques

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Description

BACKGROUND

Technical Field

[0001] The invention relates in general to an organic light emitting diode display device, and particularly to an organic light emitting diode display device comprising an electrode having two portions, wherein the ratios of an alkaline earth element to silver in the two portions are different.

Description of the Related Art

[0002] Along with the advances of display technology, various types of display devices have been developed. Organic light emitting diode display devices have become one of the most important research targets of display technology due to light weights, good display properties, and low costs. Therefore, the requirements to the functions and characteristics of organic light emitting diode display devices have gradually increased as well.

[0003] Generally, the organic light emitting diode structure of an organic light emitting diode display device is mainly comprised of two electrodes and an organic light emitting layer disposed between the two electrodes. When a voltage is applied on the two electrodes, charge carriers are produced and pass through the organic light emitting layer, and the charge carriers combined produce lights.

[0004] However, the electrodes located inside the organic light emitting display device is formed on the light emitting layer made of organic materials. The reliability and luminous efficiency of the whole display device may be influenced due to the poor adhesion between the electrodes and the organic light emitting layer. Therefore, researchers have been working on providing an organic light emitting diode display device with high reliability and great luminous efficiency.

[0005] US2010123152 (A) discloses an OLED comprising second electrode comprising a first portion (Mg:Ag) and a second portion (Ag).

SUMMARY

[0006] The invention relates to an organic light emitting diode display device according to the claims. In the organic light emitting diode display device, with an electrode having two portions, wherein the ratios of an alkaline earth element to silver in the two portions are different, luminous efficiency can be increased, the adhesion between the electrodes and an organic light emitting layer is improved, and the conductivity of the electrodes are increased.

[0007] According to an aspect of the present disclosure, an organic light emitting diode (OLED) display device is provided. The organic light emitting diode display device comprises a first substrate, a first electrode, an organic light emitting layer, a second electrode, and a second substrate. The first electrode is disposed on the first substrate. The organic light emitting layer is disposed on the first electrode. The second electrode is disposed on the organic light emitting layer. The second substrate is located on the second electrode. The material of the second electrode comprises an alkaline earth element and silver. The second electrode comprises a first portion and a second portion, and the first portion is located between the second portion and the first substrate. The ratios of the alkaline earth element to silver in the first portion and in the second portion are different.

[0008] The above and other aspects of the disclosure will become better understood with regard to the following detailed description of the non-limiting embodiment(s). The following description is made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

FIG. 1 shows an explosion diagram of an organic light emitting diode display device according to an embodiment of the present disclosure;

FIG. 2 shows a schematic diagram of the organic light emitting display panel according to an embodiment of the present disclosure;

FIG. 3 shows an organic light emitting diode display panel according to another embodiment of the present disclosure;

FIGS. 4A-4C illustrate a process for manufacturing an organic light emitting diode display panel according to an embodiment of the present disclosure; and

FIGS. 5A-5B illustrate a process of an organic light emitting diode display panel according to another embodiment of the present disclosure.

DETAILED DESCRIPTION

[0010] In the embodiments of the present disclosure, an organic light emitting diode display device is provided. In the organic light emitting diode display device, with an electrode having two portions, wherein the ratios of an alkaline earth element to silver in the two portions are different, luminous efficiency can be increased, the adhesion between the electrodes and an organic light emitting layer is improved, and the conductivity of the electrodes are increased.

[0011] Referring to FIG. 1, FIG. 1 shows an explosion diagram of an organic light emitting diode display device 10 according to an embodiment of the present disclosure. As shown in FIG. 1, the organic light emitting diode dis-

play device 10 comprises an organic light emitting display panel 100, a case 200, and a front plate 300. The organic light emitting display panel 100 is disposed in the case 200. The organic light emitting display panel 100 is connected to driving units (not shown) for receiving driving signals. The front plate 300 is also disposed in the case 200. The front plate 300 is located between the organic light emitting display panel 100 and observers. The front plate 300 being a transparent cover plate can provide protection, resistance to pressure, and stain resistance. The front plate 300 can further comprise functional structures, such as touch sensors, or barriers or lens for three-dimensional displaying. In the embodiment, as shown in FIG. 1, the case 200 comprises an upper case 200A and a lower case 200B. The organic light emitting display panel 100 and the front plate 300 are disposed between the upper case 200A and the lower case 200B. In other embodiments, the front plate 300 can be removed.

[0012] Referring to FIG. 2, FIG. 2 shows a schematic diagram of the organic light emitting display panel 100 according to an embodiment of the present disclosure. As shown in FIG. 2, the organic light emitting display panel 100 comprises a first substrate 110, a first electrode 120, an organic light emitting layer 130, a second electrode 140, and a second substrate 150. The first electrode 120 regard as anode is disposed on the first substrate 110 and is located between the first substrate 110 and the second substrate 150. The organic light emitting display panel 100 may further comprise additional structures, such as thin film transistors (TFT), conductive lines, capacitors, dielectric layers, pixel definition layers, and etc., between the first substrate 110 and the first electrode 120, and the description of those structures and the driving operations thereof are omitted herein. The organic light emitting layer 130 is disposed on the first electrode 120 and is located between the first electrode 120 and the second substrate 150. The electrodes on two sides of the organic light emitting layer 130 regard as cathode and anode to produce electron-hole pairs with a voltage applied thereon, and the electrons and holes combine in the light emitting layer for emitting lights. The second electrode 140 is disposed on the organic light emitting layer 130 and is located between the organic light emitting layer 130 and the first electrode 120. There is usually a gap between the second substrate 150 and the second electrode 140; however, the second substrate 150 and the second electrode 140 can also be contacted to each other. A capping layer (not shown) can further be disposed on the second electrode 140 to fully cover the first electrode 120, the organic light emitting layer 130, and the second electrode 140 for preventing water and oxygen from passing through, such that the life of the organic light emitting diodes can be prolonged. The first substrate 110 and the second substrate 150 can be sealed with encapsulating materials, such as frits (not shown) or sealants (not shown) connecting the first substrate 110 and the second substrate 150 for enclosing a space, in which space the organic light emitting diodes are disposed. Further, an optical cement adhesive (OCA, not shown) can be filled in the space and occupy part of the space where the organic light emitting diodes do not occupy, such that chances of the organic light emitting diodes being damaged under pressure are reduced. The materials of the first substrate 110 and the second substrate 150 can be glass, plastics, acrylates, ceramics, metals, or the composite structure thereof. The substrate (either the first substrate 110 or the second substrate 150) disposed on the light emitting surface needs to be light transmissive.

[0013] In the embodiment, the material of the first electrode 120 comprises a transparent conductive material, such as indium tin oxide (ITO), and silver (or aluminum), and indium tin oxide and silver form a composite stacked structure, such as ITO-Ag-ITO. In the structure, silver can reduce resistance and can be used as a reflective layer. When the first electrode 120 is located on the light emitting surface, the thickness of the silver layer needs to be controlled in order for lights to pass through. The material of the second electrode 140 comprises an alkaline earth element and silver. In this embodiment, the second electrode 140 is located on the light emitting surface; therefore, the thickness of the second electrode needs to be controlled in order for lights to pass through. The second electrode 140 comprises a first portion 141 and a second portion 143, the ratios of the alkaline earth element to silver in the first portion 141 and in the second portion 143 are different. In the embodiment, as shown in FIG. 2, the first portion 141 of the second electrode 140 is such as located between the second portion 143 of the second electrode 140 and the first substrate 110. In one embodiment, as shown in FIG. 2, the interface 140a between the first portion 141 and the second portion 143 has such as an irregular shape. In another embodiment, the interface between the first portion 141 and the second portion 143 can also be flat (not shown), and the first portion 141 and the second portion 143 are two stacked planar films.

[0014] In the embodiment, the organic light emitting layer 130 comprises such as electron transport layer (ETL)/ electron injection layer (EIL), emission layer (EML), and hole transport layer (HTL)/hole injection layer (HIL). The emission layer is disposed between the electron transport layer/electron injection layer and the hole transport layer/hole injection layer (not shown).

[0015] In the embodiment, the material of the electron transport layer and the material of the electron injection layer comprise, for example, BPhen (4,7-diphenyl-1,10-phenanthroline), Liq (8-hydroxyquinolinolato-lithium), BALq (Bis(2-methyl-8-quinolinolate)-4-(phenylphenolato)aluminium), TPBi (2,2',2"-(1,3,5-benzinetriyl)-tris(1-phenyl-1-H-benzimidazole), or the combinations thereof. The material of the electron injection layer further comprises lithium (Li) or cesium (Cs) dopants. In the embodiment, the material of the hole transport layer comprises, such as, NPB (N,N'-bis(naphthalen-1-yl)-N,N'-bis(phenyl)-benzidine), TPD (N,N'-bis(3-methylphenyl)-N,N'-

bis(phenyl)-benzidine), α-NPD (N,N'-bis(naphthalen-1-yl)-N,N'-bis(phenyl)-2,2'-dimethylbenzidine), or the combinations thereof. In the embodiment, the material of the hole injection layer comprises, such as, HAT-CN (Dipyrazino[2,3-f:2',3'-h]quinoxaline-2,3,6,7,10,11-hexacarbonitrile), phthalocyanine copper complex (CuPC), F4-TCNQ (2,3,5,6-tetrafluoro-7,7,8,8-tetracyano-quinodimethane), or the combinations thereof.

[0016] In the embodiment, the material of the light emitting layer may comprise fluorescence materials or phosphor materials of red light, green light, or blue light. The red fluorescence material comprises such as a mixture of rubrene and Alq_3 (Tris(8-hydroxy-quinolinato)aluminium) as the host material doped with DCJTB dye (4-(dicyanomethylene)-2-tert-butyl-6-(1,1,7,7-tetramethyljulolidin-4-yl-vinyl)-4H -pyran) as the guest material. The red phosphor material comprises such as CBP (4,4'-bis(carbazol-9-yl)biphenyl) and/or TCTA (4,4',4"-Tris(carbazol-9-yl)triphenylamine) as the host material doped with $Ir(piq)_3$ (Tris(1-phenylisoquinoline)iridium(III)) and/or $Ir(btp)_2(acac)$ (Bis(2-benzo[b]thiophen-2-yl-pyridine)(acetylacetonate)iridium(III)) as the guest material. The green fluorescence material comprises such as TPBA (2,2'-bi(9,10-diphenyl-anthracene) as the host material doped with C545T (10-(2-Benzothiazolyl)-2,3,6,7-tetrahydro-1,1,7,7-tetramethyl-1H,5H,11H-(1)be nzopyropyrano(6,7-8-l,j)quinolizin-11-one) as the guest material. The green phosphor material comprises such as CBP (4,4'-bis(carbazol-9-yl)biphenyl) and/or TCTA (4,4',4"-Tris(carbazol-9-yl)triphenylamine) as the host material doped with $Ir(ppy)_3$ (Tris(2-phenylpyridine)iridium(III)) and/or $Ir(ppy)_2(acac)$ (Bis(2-phenylpyridine)(acetylacetonate)iridium(III)) as the guest material. The blue fluorescence material comprises such as MADN (2-methyl-9,10-bis(naphthalen-2-yl)anthracene) as the host material doped with DPVABi (4,4'-bis[4-(di-p-tolylamino)styryl]biphenyl) as the guest material. The blue phosphot material comprises such as MCP (1,3-bis(carbazol-9-yl)benzene) and/or UGH-2 (1,4-bis(triphenylsilyl)benzene) as the host material doped with FlrPic (Bis(3,5-difluoro-2-(2-pyridyl)phenyl-(2-carboxypyridyl)iridium(III)) and/or Flr_6 (Bis(2,4-difluorophenylpyridinato)tetrakis(1-pyrazolyl)borate iridium(III) as the guest material.

[0017] In the embodiment, the first portion 141 of the second electrode 140 has a first thickness T1, and the second portion 143 of the second electrode 140 has a second thickness T2. The above-mentioned thicknesses are the average thicknesses of the corresponding portions. The ratio of the first thickness T1 to the second thickness T2 is, for example, 1:0.5-1:4.

[0018] In an embodiment, the ratio of the alkaline earth element to silver in the first portion 141 is larger than the ratio of the alkaline earth element to silver in the second portion 143.

[0019] In an embodiment, the alkaline earth element is such as magnesium.

[0020] In an embodiment not forming part of the present invention, the first portion 141 is formed of magnesium, and the second portion 143 is formed of silver. In another embodiment not forming part of the present invention, the first portion 141 is formed of magnesium, and the second portion 143 is formed from magnesium and silver. In a further embodiment not forming part of the present invention, the first portion 141 is formed from magnesium and silver, and the second portion 143 is formed of silver. In the embodiment of the present invention, the first portion 141 is formed from magnesium and silver, and the second portion 143 is formed from magnesium and silver.

[0021] The lowest unoccupied molecular orbital (LUMO) of the electron transport layer/electron injection layer of the organic light emitting layer 130 has a band gap (energy gap) value of 2.5-3.5 eV, the work function of magnesium is 3.46 eV, and the work function of magnesium-silver alloy if about 3.7 eV. In the embodiment, when the ratio of magnesium to the mixture of magnesium and silver in the first portion 141 is larger than that in the second portion 143, the electron transport layer/electron injection layer of the organic light emitting layer 130 is in direct contact with the first portion 141 of the second electrode 140, and the work function of magnesium is close to the work function (band gap value) of the electron transport layer/electron injection layer, the magnesium content being relatively high in the first portion 141 is advantageous to the transport or injection of electrons, and hence the luminous efficiency is improved.

[0022] In addition, the adhesion between pure magnesium and organic films is poor. In the embodiment, the material of the second electrode 140 comprises magnesium and silver, and the existence of silver is beneficial to the adhesion between the second electrode 140 and the organic light emitting layer 130. Moreover, when the size of the organic light emitting diode display panel is relatively large, the wave patterns of driving signals from ends of conductive lines tend to decay more quickly. The existence of silver can increase the conductivity of the second electrode 140, and therefore, the undesired changes of the wave patterns of driving signals are reduced.

[0023] In the embodiment, when the first portion 141 is formed from magnesium and silver, the atomic ratio of magnesium to the mixture of magnesium and silver is about between 80% and less than 100% ($100\% > Mg/(Mg+Ag) \geq 80\%$). Preferably, the atomic ratio of magnesium to the mixture of magnesium and silver is about between 90% and less than 100% ($100\% > Mg/(Mg+Ag) \geq 90\%$).

[0024] In the embodiment, when the second portion 143 is formed from magnesium and silver, the atomic ratio of magnesium to the mixture of magnesium and silver is greater than 0% and less or equal to 90% ($90\% \geq Mg/(Mg+Ag) > 0\%$). Preferably, the atomic ratio of magnesium to the mixture of magnesium and silver is greater than 0% and less or equal to 80% ($80\% \geq Mg/(Mg+Ag) > 0\%$).

[0025] Referring to FIG. 3, FIG. 3 shows an organic light emitting diode display panel 100' according to another embodiment of the present disclosure. As shown in FIG. 3, the difference between the present embodiment from the embodiment as shown in FIG. 2 is that, the second electrode 140 of the organic light emitting diode display panel 100' further comprises a third portion 260. The third portion 260 is located on the second portion 143. The third portion 260 is located between the second portion 143 and the second substrate 150. The material of the third portion 260 is silver. In the embodiment, when the first portion 141 and the second portion 143 are both formed from magnesium and silver, the silver in the third portion 260 can enhance the electron transport/injection properties of the whole electrode.

[0026] The embodiments disclosed below are for elaborating the manufacturing methods of the organic light emitting diode display panel 100 of the disclosure. Referring to FIGS. 4A-4C, FIGS. 4A-4C illustrate a process for manufacturing an organic light emitting diode display panel according to an embodiment of the present disclosure.

[0027] Referring to FIG. 4A, the first substrate 110 is provided, the first electrode 120 is formed on the first substrate 110, and the organic light emitting layer 130 is formed on the first electrode 120. The detailed description of processes of manufacturing additional components, such as thin film transistors and conductive lines, are omitted from the description of the above-mentioned steps.

[0028] Referring to FIG. 4B, the second electrode 140 is formed on the organic light emitting layer 130. In the embodiment, the second electrode 140 is formed by such as a thermal evaporation process. In the embodiment, the first portion 141 and the second portion 143 of the second electrode 140 are formed in the same thermal evaporation process simultaneously. The ratios of the alkaline earth element to silver in the first portion 141 and in the second portion 143 are different.

[0029] In the embodiment, the first portion 141 and the second portion 143 are formed in the same thermal evaporation process. When the silver content in the first portion 141 is higher, in other words, the silver contents in the first portion 141 and in the second portion 143 are closer, the interface 140a between the first portion 141 and the second portion 143 is more indefinite and less distinct, that is to say, the physical interface that can be observed by such as an electron microscopy is less clear. Nevertheless, for example, the first portion 141 and the second portion 143 are two stacked films, an area of the first portion 141 close to the organic light emitting layer 130 and an area of the second portion 143 close to the second substrate 150 still have different ratios of the alkaline earth element to silver.

[0030] Referring to FIG. 4C, the second substrate 150 is disposed on the second substrate 150. As such, the organic light emitting diode display panel 100 as shown in FIG. 4C (FIG. 2) is formed.

[0031] FIGS. 5A-5B illustrate a process of an organic light emitting diode display panel according to another embodiment of the present disclosure. Please refer to FIG. 4 and FIGS. 5A-5B.

[0032] First, the structure as shown in FIG. 4A is formed. Next, as shown in FIG. 5A, the first portion 141 of the second electrode 140 is formed on the organic light emitting layer 130. In the embodiment, the first portion 141 of the second electrode 140 is formed by such as a thermal evaporation process. The magnesium content in the first portion 141 is relatively high, and thus, an irregular structure as shown in FIG. 5A may be formed, and the first portion 141 has a surface of an irregular shape.

[0033] Next, as shown in FIG. 5B, the second portion 143 of the second electrode 140 is formed on the first portion 141. In the embodiment, the second portion 143 of the second electrode 140 is formed by such as a thermal evaporation process. The silver content in the second portion 143 is relatively high, and thus, the film formation is greater, such that the second electrode 140 can be formed with a flat surface. Moreover, the adhesion between the second electrode 140 and the organic light emitting layer 130 is increased.

[0034] Next, as shown in FIG. 4C, the second substrate 150 is disposed on the second electrode 140. As such, the organic light emitting diode display panel 100 as shown in FIG. 2 is formed.

Claims

1. An organic light emitting diode display device (10), comprising:

an organic light emitting diode display panel (100), comprising:

a first substrate (110);
a second substrate (150);
a first electrode (120) disposed between the first substrate (110) and the second substrate;
an organic light emitting layer (130) disposed between the first electrode (110) and the second substrate (150); and
a second electrode (140) disposed between the organic light emitting layer and the second substrate (150), the second electrode (140) comprising a first portion (141) and a second portion (143), the first portion (141) is located between the second portion (143) and the first substrate (110),

characterized in that: the first portion (141) comprises alkaline earth element and silver, the second portion (143) comprises alkaline earth element and silver, and a ratio of the alkaline earth element to silver of the first portion (141)

is different from a ratio of the alkaline earth element to silver of the second portion (143).

2. The organic light emitting diode display device according to claim 1, wherein the alkaline earth element comprises magnesium (Mg) and calcium (Ca).

3. The organic light emitting diode display device (10) according to claim 2, wherein the first portion (141) comprises magnesium and silver, and magnesium is greater than 80% and less than 100%.

4. The organic light emitting diode display device (10) according to claim 2, wherein the first portion (141) comprises magnesium and silver, and magnesium is greater than 90% and less than 100%.

5. The organic light emitting diode display device (10) according to claim 2, wherein the second portion (143) comprises magnesium and silver, and magnesium is greater than 0% and less than 90%.

6. The organic light emitting diode display device (10) according to claim 2, wherein the second portion (143) comprises magnesium and silver, and magnesium is greater than 0% and less than 80%.

7. The organic light emitting diode display device (10) according to claim 1, wherein the ratio of the alkaline earth element in the first portion (141) is greater than the ratio of the alkaline earth element in the second portion (143).

8. The organic light emitting diode display device (10) according to claim 1, wherein the ratio of a first thickness of the first portion (141) to a second thickness of the second portion (143) is 1:0.5-1:4.

9. The organic light emitting diode display device (10) according to claim 1, further comprising:
a case (200), wherein the organic light emitting diode display panel is disposed in the case (200).

10. The organic light emitting diode display device (10) according to claim 1, wherein the case (200) comprises an upper case (200A) and a lower case (200B), and the organic light emitting display panel (100) is disposed between the upper case (200A) and the lower case (200B).

11. The organic light emitting diode display device (10) according to claim 10, further comprising a front plate (300) disposed between the upper case (200A) and the lower case (200B).

12. The organic light emitting diode display device (10) according to claim 1, wherein the second electrode (140) further comprises a third portion (260) located on the second portion (143), and the material of the third portion (260) is silver.

Patentansprüche

1. Organische Leuchtdiodenanzeigevorrichtung (10), umfassend:

ein organisches Leuchtdiodenanzeigepanel (100), umfassend:

ein erstes Substrat (110);
ein zweites Substrat (150);
eine erste Elektrode (120), die sich zwischen dem ersten Substrat (110) und dem zweiten Substrat befindet;
eine organische Leuchtschicht (130), die sich zwischen der ersten Elektrode (110) und dem zweiten Substrat (150) befindet; und
eine zweite Elektrode (140), die sich zwischen der organischen Leuchtschicht und dem zweiten Substrat (150) befindet, wobei die zweite Elektrode (140) einen ersten Teil (141) und einen zweiten Teil (143) umfasst und sich der erste Teil (141) zwischen dem zweiten Teil (143) und dem ersten Substrat (110) befindet;

dadurch gekennzeichnet, dass:
der erste Teil (141) ein Erdalkalielement und Silber umfasst, der zweite Teil (143) ein Erdalkalielement und Silber umfasst und das Verhältnis von Erdalkalielement zu Silber im ersten Teil (141) von dem Verhältnis von Erdalkalielement zu Silber im zweiten Teil (143) verschieden ist.

2. Organische Leuchtdiodenanzeigevorrichtung gemäß Anspruch 1, wobei das Erdalkalielement Magnesium (Mg) und Calcium (Ca) umfasst.

3. Organische Leuchtdiodenanzeigevorrichtung (10) gemäß Anspruch 2, wobei der erste Teil (141) Magnesium und Silber umfasst und Magnesium in einem Anteil von mehr als 80% und weniger als 100% vorhanden ist.

4. Organische Leuchtdiodenanzeigevorrichtung (10) gemäß Anspruch 2, wobei der erste Teil (141) Magnesium und Silber umfasst und Magnesium in einem Anteil von mehr als 90% und weniger als 100% vorhanden ist.

5. Organische Leuchtdiodenanzeigevorrichtung (10) gemäß Anspruch 2, wobei der zweite Teil (143) Magnesium und Silber umfasst und Magnesium in einem Anteil von mehr als 0% und weniger als 90%

vorhanden ist.

6. Organische Leuchtdiodenanzeigevorrichtung (10) gemäß Anspruch 2, wobei der zweite Teil (143) Magnesium und Silber umfasst und Magnesium in einem Anteil von mehr als 0% und weniger als 80% vorhanden ist.

7. Organische Leuchtdiodenanzeigevorrichtung (10) gemäß Anspruch 1, wobei der Anteil des Erdalkalielements in dem ersten Teil (141) größer ist als der Anteil des Erdalkalielements in dem zweiten Teil (143).

8. Organische Leuchtdiodenanzeigevorrichtung (10) gemäß Anspruch 1, wobei das Verhältnis einer ersten Dicke des ersten Teils (141) zu einer zweiten Dicke des zweiten Teils (143) 1:0,5 bis 1:4 beträgt.

9. Organische Leuchtdiodenanzeigevorrichtung (10) gemäß Anspruch 1, weiterhin umfassend:
ein Gehäuse (200), wobei sich das organische Leuchtdiodenanzeigepanel in dem Gehäuse (200) befindet.

10. Organische Leuchtdiodenanzeigevorrichtung (10) gemäß Anspruch 1, wobei das Gehäuse (200) ein oberes Gehäuse (200A) und ein unteres Gehäuse (200B) umfasst und sich das organische Leuchtdiodenanzeigepanel (100) zwischen dem oberen Gehäuse (200A) und dem unteren Gehäuse (200B) befindet.

11. Organische Leuchtdiodenanzeigevorrichtung (10) gemäß Anspruch 10, weiterhin umfassend eine Frontplatte (300), die sich zwischen dem oberen Gehäuse (200A) und dem unteren Gehäuse (200B) befindet.

12. Organische Leuchtdiodenanzeigevorrichtung (10) gemäß Anspruch 1, wobei die zweite Elektrode (140) weiterhin einen dritten Teil (260) umfasst, der sich auf dem zweiten Teil (143) befindet, und das Material des dritten Teils (260) Silber ist.

Revendications

1. Dispositif d'affichage à diodes électroluminescentes organiques (10), comprenant :

un panneau d'affichage à diodes électroluminescentes organiques (100), comprenant :

un premier substrat (110),
un deuxième substrat (150),
une première électrode (120) située entre le premier substrat (110) et le deuxième substrat,
une couche d'émission de lumière organique (130) située entre la première électrode (110) et le deuxième substrat (150), et
une deuxième électrode (140) située entre la couche d'émission de lumière organique et le deuxième substrat (150), la deuxième électrode (140) comprenant une première partie (141) et une deuxième partie (143), la première partie (141) étant située entre la deuxième partie (143) et le premier substrat (110),

caractérisé en ce que
la première partie (141) comprend un élément alcalino-terreux et de l'argent, la deuxième partie (143) comprend un élément alcalino-terreux et de l'argent, et le rapport de l'élément alcalino-terreux à l'argent dans la première partie (141) est différent du rapport de l'élément alcalino-terreux à l'argent dans la deuxième partie (143).

2. Dispositif d'affichage à diodes électroluminescentes organiques selon la revendication 1, dans lequel l'élément alcalino-terreux comprend le magnésium (Mg) et le calcium (Ca).

3. Dispositif d'affichage à diodes électroluminescentes organiques (10) selon la revendication 2, dans lequel la première partie (141) comprend du magnésium et de l'argent, et le pourcentage de magnésium est plus de 80 % et moins de 100 %.

4. Dispositif d'affichage à diodes électroluminescentes organiques (10) selon la revendication 2, dans lequel la première partie (141) comprend du magnésium et de l'argent, et le pourcentage de magnésium est plus de 90 % et moins de 100 %.

5. Dispositif d'affichage à diodes électroluminescentes organiques (10) selon la revendication 2, dans lequel la deuxième partie (143) comprend du magnésium et de l'argent, et le pourcentage de magnésium est plus de 0 % et moins de 90 %.

6. Dispositif d'affichage à diodes électroluminescentes organiques (10) selon la revendication 2, dans lequel la deuxième partie (143) comprend du magnésium et de l'argent, et le pourcentage de magnésium est plus de 0 % et moins de 80 %.

7. Dispositif d'affichage à diodes électroluminescentes organiques (10) selon la revendication 1, dans lequel la teneur de l'élément alcalino-terreux dans la première partie (141) est supérieure à la teneur de l'élément alcalino-terreux dans la deuxième partie (143).

8. Dispositif d'affichage à diodes électroluminescentes

organiques (10) selon la revendication 1, dans lequel le rapport d'une première épaisseur de la première partie (141) à une deuxième épaisseur de la deuxième partie (143) est de 1 : 0,5 à 1 : 4.

9. Dispositif d'affichage à diodes électroluminescentes organiques (10) selon la revendication 1, comprenant en outre :
un boîtier (200), dans lequel le panneau d'affichage à diodes électroluminescentes organiques est situé dans le boîtier (200).

10. Dispositif d'affichage à diodes électroluminescentes organiques (10) selon la revendication 1, dans lequel le boîtier (200) comprend un boîtier supérieur (200A) et un boîtier inférieur (200B), et le panneau d'affichage à diodes électroluminescentes organiques (100) est situé entre le boîtier supérieur (200A) et le boîtier inférieur (200B).

11. Dispositif d'affichage à diodes électroluminescentes organiques (10) selon la revendication 10, comprenant en outre une plaque frontale (300) située entre le boîtier supérieur (200A) et le boîtier inférieur (200B).

12. Dispositif d'affichage à diodes électroluminescentes organiques (10) selon la revendication 1, dans lequel la deuxième électrode (140) comprend en outre une troisième partie (260) située sur la deuxième partie (143), et le matériau de la troisième partie (260) est l'argent.

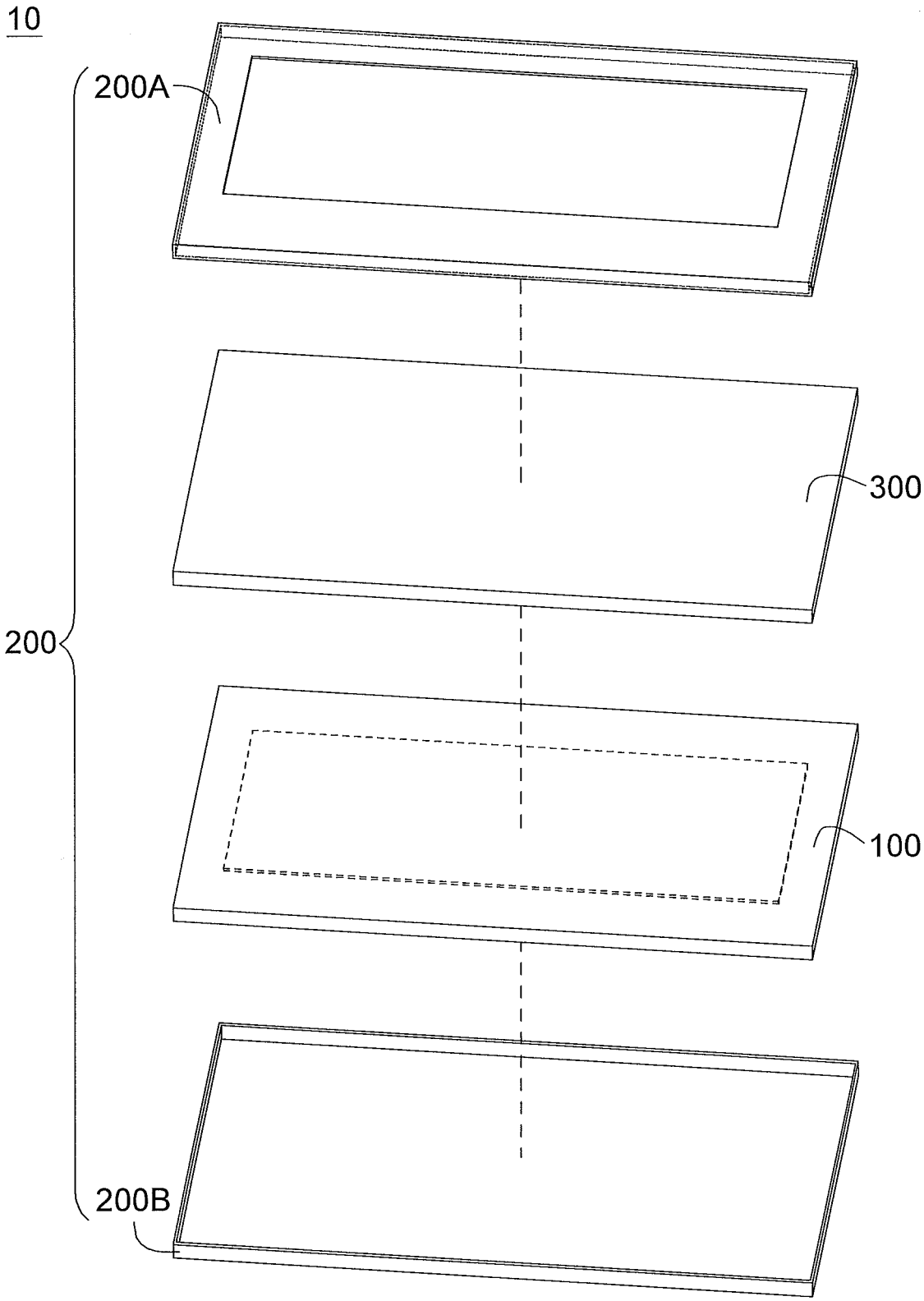

FIG. 1

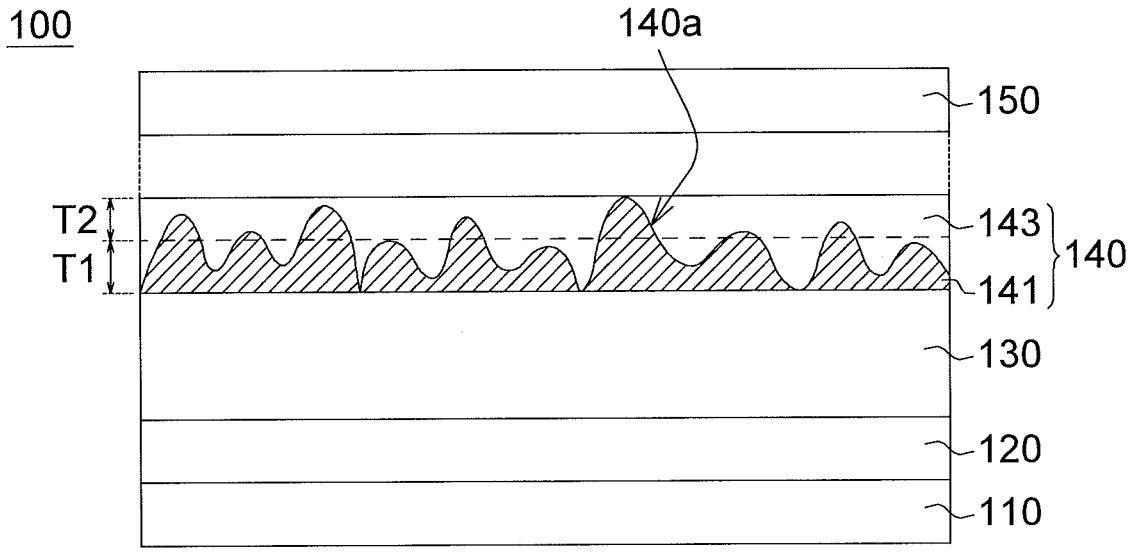
100
140a
150
T2
T1
143
140
141
130
120
110

FIG. 2

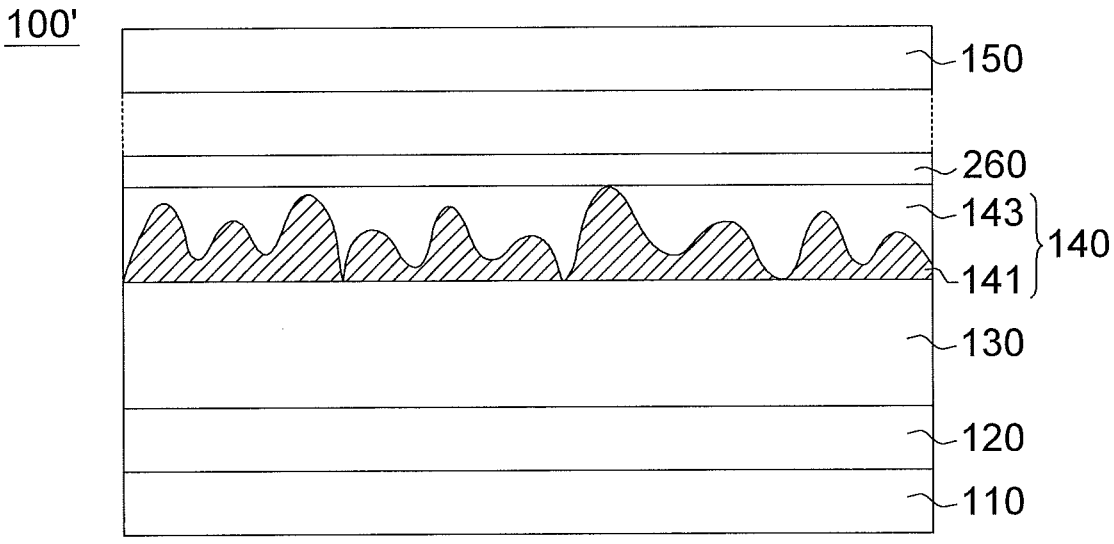
100'
150
260
143
140
141
130
120
110

FIG. 3

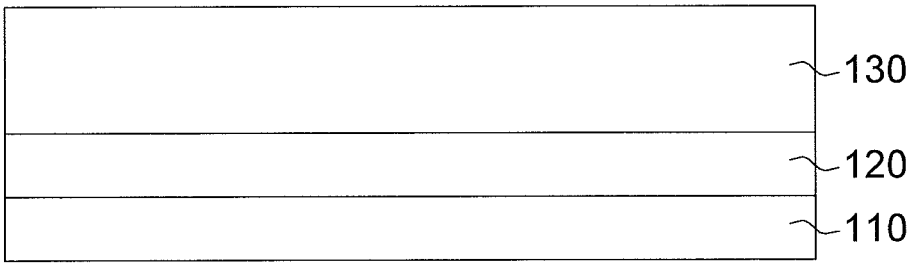

FIG. 4A

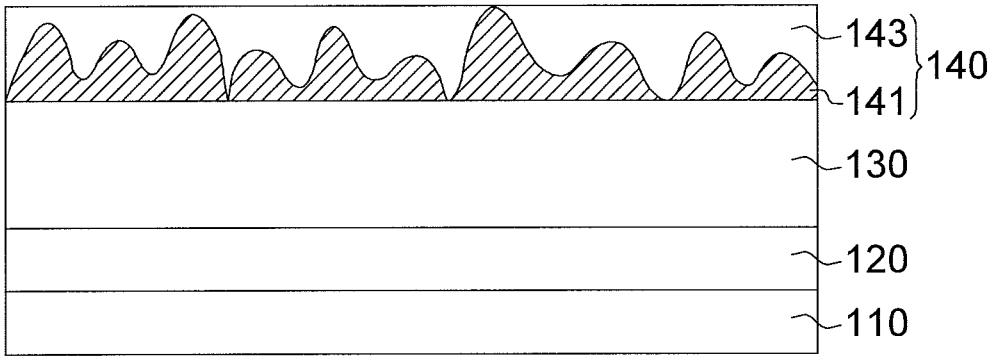

FIG. 4B

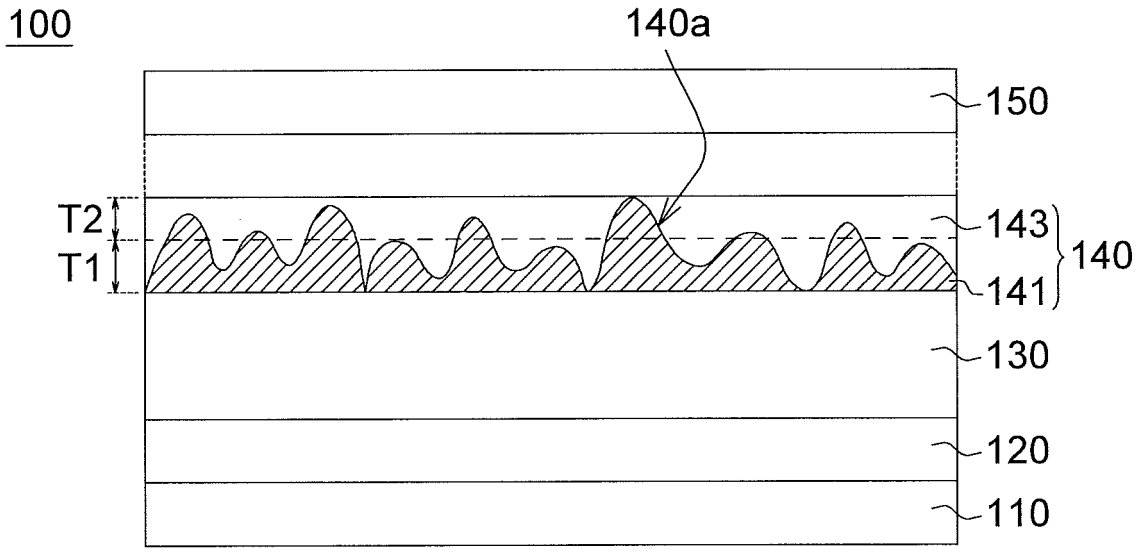

FIG. 4C

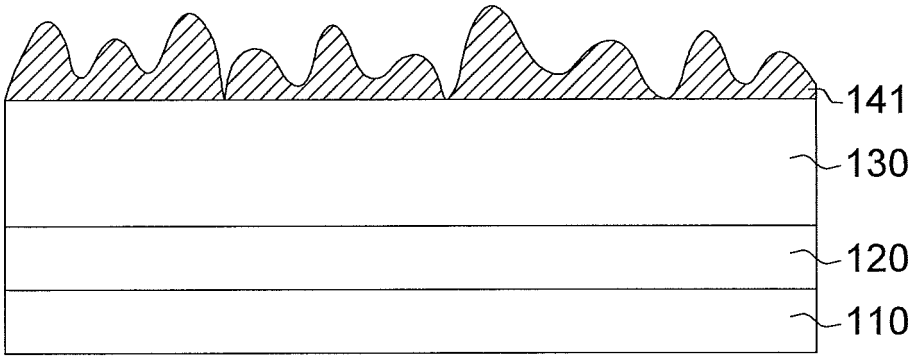

FIG. 5A

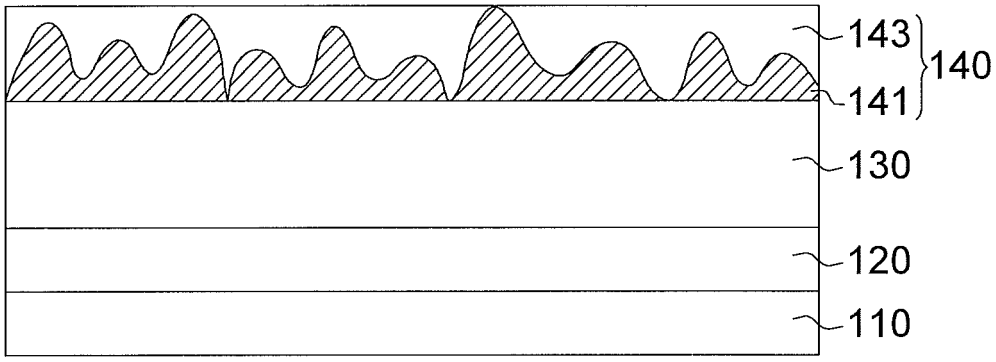

FIG. 5B

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2010123152 A **[0005]**

专利名称(译)	有机发光二极管显示装置		
公开(公告)号	EP2733765B1	公开(公告)日	2019-06-12
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[标]申请(专利权)人(译)	群创光电股份有限公司		
申请(专利权)人(译)	群创光电		
当前申请(专利权)人(译)	群创光电		
[标]发明人	CHAO KUANG PIN CHU CHIEN TZU HUNG MIN YU		
发明人	CHAO, KUANG-PIN CHU, CHIEN-TZU HUNG, MIN-YU		
IPC分类号	H01L51/52		
CPC分类号	H01L51/5221 H01L51/52 H01L51/5212 H01L51/5228 H01L51/5231 H01L51/5237 H01L51/524 H01L2251/301		
优先权	201210472034.1 2012-11-20 CN		
其他公开文献	EP2733765A1		
外部链接	Espacenet		

摘要(译)

提供一种有机发光二极管（OLED）显示装置。有机发光二极管显示装置包括第一基板，第一电极，有机发光层，第二电极和第二基板。第一电极设置在第一基板上。有机发光层设置在第一电极上。第二电极设置在有机发光层上。第二基板位于第二电极上。第二电极的材料包括碱土元素和银。第二电极包括第一部分和第二部分，第一部分位于第二部分和第一基板之间。第一部分和第二部分中碱土元素与银的比例是不同的。

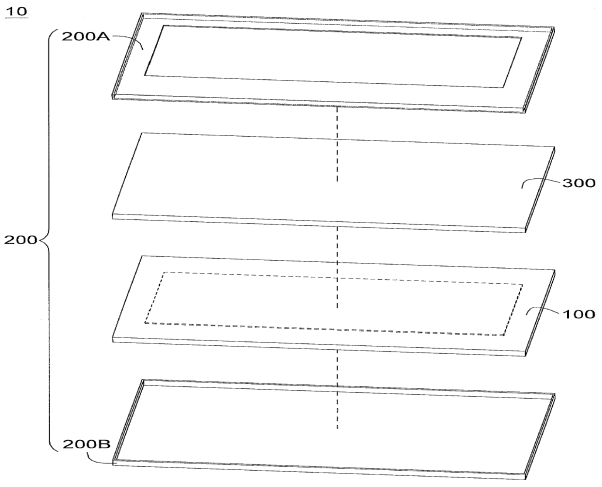

FIG. 1