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(54) Organic light-emitting display and method of manufacturing the same

Organische lichtemittierende Anzeige und Verfahren zu ihrer Herstellung

Affichage électroluminescent organique et son procédé de fabrication

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- **Choi, Chaun-Gi**
446-711 Gyunggi-Do (KR)
- **Ahn, Tae-Kyung**
446-711 Gyunggi-Do (KR)

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(74) Representative: **Mouteney, Simon James**
Marks & Clerk LLP
90 Long Acre
London
WC2E 9RA (GB)

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(73) Proprietor: **Samsung Display Co., Ltd.**
Gyeonggi-do (KR)

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(72) Inventors:
 • **Park, Sang-Il**
446-711 Gyunggi-Do (KR)

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Description

BACKGROUND

1. Field

[0001] The present invention relates to an organic light-emitting display device, and more particularly, to an organic light-emitting display device including a capacitor having an increased capacity and a method of manufacturing the organic light-emitting display device.

2. Description of the Related Art

[0002] In organic light-emitting display devices that have recently attracted much attention, each pixel includes a thin film transistor (TFT), a capacitor, and an organic light-emitting device connected to the TFT and the capacitor. The organic light-emitting device emits light by receiving a proper driving signal from the TFT and the capacitor and displays a desired image.

[0003] In order to more stably display an image of an organic light-emitting display device, the capacitor is required to have a sufficient capacity. That is, when the capacitor has a sufficient capacity, an image can be more naturally displayed. However, if a size of the capacitor is merely increased to increase the capacity thereof, an emission area of the organic light-emitting device may be relatively decreased, which in turn, may decrease the brightness of the organic light-emitting device.

[0004] US 2010 0270538 discloses an organic light emitting display device and its manufacturing method, wherein the organic light emitting display device includes at least one capacitor including a first electrode formed on a layer on which a gate electrode is formed by using a material forming the gate electrode, and a second electrode formed on a layer on which source/drain electrodes are formed by using a material used to form the source/drain electrodes.

[0005] EP 2214211 A2 discloses a flat panel display apparatus including a first insulation layer formed on a substrate, and a second insulation layer formed on a gate electrode, and a source electrode and a drain electrode formed on the second insulation layer.

[0006] EP 2239780 A1 discloses a method of manufacturing an active matrix substrate which includes forming a patterned electrode with an insulating film.

[0007] US 2006 0091785 A1 discloses an organic thin film transistor and an organic electroluminescent display device, wherein the OTFT includes a drain electrode functioning as a pixel electrode of an organic emission element.

SUMMARY

[0008] The present invention sets out to provide a capacitor having an increased capacity and an organic light-emitting display device including the capacitor.

[0009] According to an aspect of the invention, there is provided an organic light-emitting display device, including an organic light-emitting device, a thin film transistor (TFT) electrically connected to the organic light-emitting device, and a capacitor electrically connected to the organic light-emitting device, the capacitor including a first electrode layer and a second electrode layer opposite to each other, and only a first insulating layer interposed as a single layer between the first electrode layer and the second electrode layer.

[0010] The first electrode layer may include a transparent electrode layer on the substrate, and a low resistance electrode layer on the transparent electrode layer.

[0011] The TFT includes a gate electrode including a same material with a same thickness as the first electrode layer of the capacitor, the gate electrode and first electrode layer being positioned directly on a same element, a second insulating layer, acting as a gate insulating layer covering the gate electrode, an active layer on the second insulating layer, a third insulating layer on the active layer, the third insulating layer being a continuous layer with the first insulating layer, and source and drain electrodes on the third insulating layer and connected to the active layer, the source and drain electrodes including a same material to a same thickness as the second electrode layer of the capacitor.

[0012] The gate electrode may include a transparent electrode layer on the substrate, and a low resistance electrode layer on the transparent electrode layer.

[0013] The organic light-emitting device may include a pixel electrode connected to the TFT, an opposing electrode opposite to the pixel electrode, and an organic emission layer interposed between the pixel electrode and the opposing electrode.

[0014] The pixel electrode may include a transparent electrode layer on the substrate and connected to the organic emission layer, and a low resistance electrode layer on the transparent electrode layer and connected to the TFT.

[0015] According to another aspect of the invention, there is provided a method of manufacturing an organic light-emitting display device, the method including forming an organic light-emitting device, forming a thin film transistor (TFT) electrically connected to the organic light-emitting device, and forming a capacitor electrically connected to the organic light-emitting device, the capacitor including a first electrode layer and a second electrode layer opposite to each other, and only a first insulating layer interposed as a single layer between the first electrode layer and the second electrode layer.

[0016] The method further includes forming a pixel electrode of the organic light-emitting device, a gate electrode of the TFT, and the first electrode layer of the capacitor of a same layer on the substrate, directly on the same element, forming a second insulating layer, acting as a gate insulating layer, to cover the gate electrode of the TFT, forming an active layer on the second insulating layer, forming the first insulating layer on the first elec-

trode layer of the capacitor and a third insulating layer on the active layer of a same continuous layer, and forming the second electrode layer on the first insulating layer and source and drain electrodes on the third insulating layer of a same layer.

[0017] Each of the first electrode layer, the gate electrode, and the pixel electrode may include a transparent electrode layer formed on the substrate and a low resistance electrode layer formed on the transparent electrode layer.

[0018] The method may further include forming an organic emission layer on the pixel electrode, and forming an opposing electrode on the organic emission layer.

[0019] The organic emission layer may be formed on the exposed pixel electrode, and the pixel electrode is partially exposed by etching a pixel-defining layer formed on the pixel electrode.

[0020] At least some of the above and other features of the invention are set out in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The above and other features and advantages of the invention will become more apparent upon making reference to the following description of embodiments of the invention on which is given below with reference to the attached drawings in which:

FIG. 1 is a cross-sectional view of an organic light-emitting display device according to an embodiment of the invention; and

FIGS. 2A through 2F are cross-sectional views of stages in a method of manufacturing an organic light-emitting display device according to an embodiment of the invention.

DETAILED DESCRIPTION

[0022] As illustrated in FIG. 1, an organic light-emitting display device according to an embodiment of the invention includes a thin film transistor (TFT) 30, a capacitor 20, and an organic light-emitting device 40 on a substrate 10. FIG. 1 illustrates only a single pixel of the organic light-emitting display device, but the organic light-emitting display device includes a plurality of the pixels.

[0023] The organic light-emitting device 40, which is electrically connected to the TFT 30 and the capacitor 20, emits light. The organic light-emitting device 40 includes pixel electrodes 41 and 42 that are included in each pixel, an opposite electrode 44 which is a common electrode, and an organic emission layer 43 interposed between the pixel electrode 41 and the opposite electrode 44. Thus, if a voltage is applied to the pixel electrodes 41 and 42 from the TFT 30 and the capacitor 20, i.e., a proper voltage condition is formed between the pixel electrodes 41 and 42 and the opposite electrode 44, the organic emission layer 43 emits light.

[0024] The pixel electrode 41 may be a transparent

electrode layer formed of, e.g., indium tin oxide (ITO), indium zinc oxide (IZO), or zinc oxide (ZnO), and the pixel electrode 42 may be a low resistance electrode layer formed of, e.g., molybdenum (Mo). The pixel electrodes 41 and 42 may partially form a multi-layered structure.

[0025] The opposite electrode 44 may include a semi-permeable reflecting layer formed of, e.g., Ag, Mg, Al, Pt, Pd, Au, Ni, Nd, Ir, Cr, Li, and/or Ca in a thin film type layer, or may include a light-transmissive metal oxide formed of, e.g., ITO, IZO, or ZnO.

[0026] The organic emission layer 43 interposed between the pixel electrodes 41 and 42 and the opposite electrode 44 may have a stacked structure in which an emitting layer (EML) and at least one of a hole injection layer (HIL), a hole transport layer (HTL), an electron injection layer (EIL), an electron transport layer (ETL), etc. are stacked. The pixel electrode 41, which is a transparent electrode layer, contacts the organic emission layer 43, and the pixel electrode 42, which is a low resistance electrode layer, connects source and drain electrodes 36 and 37 of the TFT 30 with the pixel electrode 41.

[0027] Although not shown in FIG. 1, a protection layer may further be formed on the opposite electrode 44. Further, the organic light-emitting display device may be sealed, e.g., by glass.

[0028] Reference numeral 50 denotes a pixel-defining layer. The organic emission layer 43 and the opposite electrode 44 may be formed on the pixel electrode 41 that is exposed by etching the pixel-defining layer 50.

[0029] Next, the TFT 30 includes gate electrodes 31 and 32 formed on the substrate 10, a second insulating layer 33 (or a gate insulating layer) covering the gate electrodes 31 and 32, an active layer 34 formed on the second insulating layer 33, a third insulating layer 35 (or an etching stop layer) covering the active layer 34, and the source and drain electrodes 36 and 37. Each of the source and drain electrodes 36 and 37 is connected to the active layer 34 via an aperture 35a of the third insulating layer 35.

[0030] A buffer layer (not shown) may further be formed on the substrate 10. The buffer layer may be formed of an inorganic material, e.g., silicon oxide.

[0031] The gate electrodes 31 and 32 may be formed as a single layer or a plurality of layers on the substrate 10. In the current embodiment, the gate electrodes 31 and 32 may be formed as a multi layer similar to the pixel electrodes 41 and 42, wherein the gate electrode 31 may be a transparent electrode layer and the gate electrode 32 may be a low resistance electrode layer.

[0032] The second insulating layer 33 may be formed of, e.g., silicon oxide, tantalum oxide, and/or aluminum oxide. However, example embodiments are not limited thereto.

[0033] The active layer 34 is formed on the second insulating layer 33. The active layer 34 may be formed of an oxide semiconductor, e.g., a G-I-Z-O layer [a(In₂O₃)b(Ga₂O₃)c(ZnO) layer], wherein a, b, and c are real numbers satisfying the conditions of a≥0, b≥0, and c>0, re-

spectively. In another example, the active layer 34 may be a Hf-In-Zn-O layer.

[0034] The third insulating layer 35 covering the active layer 34 may be formed of, e.g., silicon oxide, tantalum oxide, and/or aluminum oxide. However, example embodiments are not limited thereto.

[0035] The source and drain electrodes 36 and 37 are formed on the third insulating layer 35 to contact the active layer 34 via the apertures 35a. The drain electrode 37 is connected to the pixel electrode 42.

[0036] A structure of the capacitor 20 will now be described. The capacitor 20 includes first electrode layers 21 and 22, a first insulating layer 25, and second electrode layer 26 that are sequentially stacked on the substrate 10.

[0037] The first electrode layers 21 and 22 are formed of the same layers as the above-described gate electrodes 31 and 32 of the TFT 30, respectively. The first electrode layers 21 and 22 may be formed as a multi layer structure, i.e., the first electrode 21 may be a transparent electrode layer and the first electrode 22 may be a low resistance electrode layer, similar to the respective gate electrodes 31 and 32.

[0038] The first insulating layer 25 is formed of the same layer as the third insulating layer 35 of the TFT 30.

[0039] The second electrode layer 26 is formed of the same layer as the source and drain electrodes 36 of the TFT 30. Further, the second electrode layer 26 is formed of a conductive metal material that is the same material for forming the source and drain electrodes 36 and 37.

[0040] As such, since only the first insulating layer 25 is interposed as a single layer between the first electrode layers 21 and 22 and the second electrode layer 26, e.g., the first insulating layer 25 may be a single layer directly between the first electrode layer 22 and the second electrode layer 26, the capacity of the capacitor 20 may be increased. That is, since the capacity of the capacitor 20 is inversely proportional to a distance between an uppermost surface of the first electrode layers 21 and 22, i.e., an uppermost surface of the first electrode layer 22, and the second electrode layer 26, a decreased distance between the uppermost surface of the first electrode layers 21 and 22 and the second electrode layer 26 may increase the capacity of the capacitor 20. In the organic light-emitting display device having the above-described structure, only the first insulating layer 25 is interposed between the first electrode layers 21 and 22 and the second electrode layer 26, and thus, a high capacity of the capacitor 20 can be easily secured. Also, as will be described in a method of manufacturing the organic light-emitting display device of FIG. 1, a structure in which only the first insulating layer 25 is interposed between the first electrode layers 21 and 22 and the second electrode layer 26 is naturally formed in a process of forming each layer constituting the organic light-emitting device 40, the TFT 30, and the capacitor 20, and thus, there is no need to perform an additional mask process.

[0041] Hereinafter, a method of manufacturing the or-

ganic light-emitting display device of FIG. 1 will be described with reference to FIGS. 2A-2F. FIGS. 2A through 2F are cross-sectional views for sequentially describing a method of manufacturing the organic light-emitting display device of FIG. 1.

[0042] First, as illustrated in FIG. 2A, the first electrode layers 21 and 22 of the capacitor 20, the gate electrodes 31 and 32 of TFT 30, and the pixel electrodes 41 and 42 of the organic light-emitting device 40 are formed on the substrate 10. That is, the first electrode layer 21, the gate electrode 31, and the pixel electrode 41, which are transparent electrode layers, are formed, e.g., patterned, of a same first layer on, e.g., directly on, the substrate 10. Next, the first electrode layer 22, the gate electrode 32, and the pixel electrode 42, which are low resistance electrode layers, are formed, e.g., patterned, of a same second layer on, e.g., directly on, the first layer. Although not shown in FIG. 2A, a buffer layer may further be formed on the substrate 10. As the electrode layer 21, gate electrode 31, and pixel electrode 41 are formed of a same layer, they are formed simultaneously to a substantially same thickness, as measured from the substrate 10. Similarly, as the first electrode layer 22, gate electrode 32, and pixel electrode 42, are formed of a same layer, they are formed simultaneously to a substantially same thickness, as measured from the substrate 10. Each of the first electrode layer 22, gate electrode 32, and pixel electrode 42 overlaps, e.g., completely overlaps, a respective one of the electrode layer 21, gate electrode 31, and pixel electrode 41.

[0043] Then, as illustrated in 2B, the second insulating layer 33 covering the gate electrodes 31 and 32 of the TFT 30 is formed, followed by forming the active layer 34 on the second insulating layer 33. Next, an additional insulation layer is formed to cover the resultant structure, i.e., the pixel electrode 42, active layer 34, and first electrode 22. The additional insulation layer is a single layer having a first portion on the first electrode 22, i.e., first insulating layer 25, and a second portion on the pixel electrode 42 and active layer 34, i.e., third insulating layer 35. In other words, the first and third insulating layers 25 and 35 define a single continuous insulation layer overlapping the organic light-emitting device 40, the TFT 30, and the capacitor 20.

[0044] Next, the apertures 35a and 42a are formed in the third insulating layer 35, as illustrated in FIG. 2C. Then, the second electrode layer 26 of the capacitor 20 and the source and drain electrodes 36 and 37 of the TFT 30 are formed, as illustrated in FIG. 2D. At this time, the source electrode 36 is connected to the active layer 34 via the aperture 35a, and the drain electrode 37 is connected to the active layer 34 and the pixel electrode 42 respectively via the aperture 35a and the aperture 42a. When the source and drain electrodes 36 and 37 are patterned, a part of the pixel electrode 42 is etched, and thus, the pixel electrodes 41 and 42 may partially form a multi-layered structure.

[0045] As such, a basic structure of the capacitor 20

is completed, and thus, a stacked structure in which the first electrode layers 21 and 22, the first insulating layer 25, and the second electrode layer 26 are sequentially stacked is formed, as illustrated in FIG. 2D. The stacked structure in which an electrode layer, an insulating layer, and an electrode layer are sequentially stacked may increase the capacity of the capacitor 20.

[0046] In contrast, a conventional capacitor having a stacked structure may include a plurality of insulating layers between the first and second electrode layers, thereby decreasing capacity. However, as the capacitor 20 according to an embodiment of the invention includes a single insulating layer that is formed as a single layer between two electrode layers, a total thickness of the insulating layer can be relatively decreased, thereby increasing the capacity of a capacitor. Also, since the first insulating layer 25 can be formed at the same time as the third insulating layer 35 of the TFT 30, a number of manufacturing processes may be decreased, thereby reducing manufacturing costs.

[0047] Then, as illustrated in FIG. 2E, the pixel-defining layer 50 is formed, followed by etching of the pixel-defining layer 50 to expose a part of the pixel electrode 41. Then, the organic emission layer 43 is formed on the exposed pixel electrode 41, followed by formation of the opposite electrode 44 on the organic emission layer 43 to complete the manufacturing of the organic light-emitting display device, as illustrated in FIG. 2F. A protection layer may further be formed on the organic light-emitting display device, and the organic light-emitting display device may be sealed with glass.

[0048] Therefore, as described above, in an organic light-emitting display device according to the invention, since an insulating layer is formed as a single layer between two electrodes of the capacitor 20, the capacity of the capacitor 20 may be increased without increasing the size of the capacitor 20. That is, the capacity of the capacitor 20 may be increased without reducing the size of an emission area of an organic light-emitting device. As such, the organic light-emitting device may display an image more stably and naturally.

[0049] While the invention has been particularly shown and described with reference to embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the scope of the invention as defined by the following claims.

Claims

1. An organic light-emitting display device, comprising:
 - an organic light-emitting device (40);
 - a thin film transistor (TFT) (30) electrically connected to the organic light-emitting device (40); and
 - a capacitor (20) electrically connected to the or-

ganic light-emitting device (40), the capacitor (20) including a first electrode layer (21, 22) and a second electrode layer (26) opposite to each other, and only a first insulating layer (25) interposed as a single layer between the first electrode layer (21, 22) and the second electrode layer (26);

wherein the TFT (30) includes:

- a gate electrode (31, 32) including the same material with the same thickness as the first electrode layer (21, 22) of the capacitor (20), the gate electrode (31, 32) and first electrode layer (21, 22) being positioned directly on the same element;
- a second insulating layer (33), acting as a gate insulating layer, covering the gate electrode (31, 32);
- an active layer (34) on the second insulating layer (33);
- a third insulating layer (35) on the active layer (34), the third insulating layer (35) being continuous with the first insulating layer (25); and
- source and drain electrodes (36,37) on the third insulating layer (35) and connected to the active layer (34), the source and drain electrodes (36,37) including the same material to the same thickness as the second electrode layer (26) of the capacitor (20).

2. An organic light-emitting display device according to claim 1, wherein the first electrode layer (21, 22) includes a transparent electrode layer (21) on a substrate (10), and a low resistance electrode layer (22) on the transparent electrode layer.
3. An organic light-emitting display device according to claim 1 or 2, wherein the gate electrode (31, 32) includes a transparent electrode layer (31) on the substrate (10), and a low resistance electrode layer (32) on the transparent electrode layer.
4. An organic light-emitting display device according to any preceding claim, wherein the organic light-emitting device (40) includes a pixel electrode (41, 42) connected to the TFT (30), an opposing electrode opposite to the pixel electrode (41, 42), and an organic emission layer (43) interposed between the pixel electrode (41, 42) and the opposing electrode.
5. An organic light-emitting display device according to claim 4, wherein the pixel electrode (41, 42) includes a transparent electrode layer (41) on the substrate (10) and connected to the organic emission layer (43), and a low resistance electrode layer (42) on the transparent electrode layer and connected to the TFT (30).

6. A method of manufacturing an organic light-emitting display device, the method comprising:

forming an organic light-emitting device (40);
forming a thin film transistor (TFT) (30) electrically connected to the organic light-emitting device (40);
forming a capacitor (20) electrically connected to the organic light-emitting device (40), the capacitor including a first electrode layer (21, 22) and a second electrode layer (26) opposite to each other, and only a first insulating layer (25) interposed as a single layer between the first electrode layer (21, 22) and the second electrode layer (26); and
forming a pixel electrode of the organic light-emitting device, a gate electrode of the TFT (30), and the first electrode layer (21, 22) of the capacitor (20) of a same layer on a substrate (10), directly on the same element;

forming a second insulating layer (22), acting as a gate insulating layer, to cover the gate electrode of the TFT (30);

forming an active layer (34) on the second insulating layer (22);

forming the first insulating layer (25) on the first electrode layer (21, 22) of the capacitor (20) and a third insulating layer (35) on the active layer (34) of a same continuous layer;

and

forming the second electrode layer (26) on the first insulating layer (25) and source and drain electrodes (35) on the third insulating layer of a same layer.

7. A method according to claim 6, wherein each of the first electrode layer (21, 22), the gate electrode, and the pixel electrode (41, 42) includes a transparent electrode layer formed on the substrate (10) and a low resistance electrode layer formed on the transparent electrode layer.

8. A method according to claim 6 or 7, further comprising:

forming an organic emission layer (43) on the pixel electrode (41, 42); and
forming an opposing electrode on the organic emission layer (43).

9. The method of claim 8, wherein the organic emission layer (43) is formed on the exposed pixel electrode (41), and the pixel electrode (41) is partially exposed by etching a pixel-defining layer formed on the pixel electrode (41).

Patentansprüche

1. Organische lichtemittierende Anzeigevorrichtung, umfassend:

eine organische lichtemittierende Vorrichtung (40);

einen Dünnschichttransistor (TFT) (30), der elektrisch mit der organischen lichtemittierenden Vorrichtung (40) verbunden ist; und

einen Kondensator (20), der elektrisch mit der organischen lichtemittierenden Vorrichtung (40) verbunden ist, wobei der Kondensator (20) eine erste Elektroden-schicht (21, 22) und eine zweite Elektroden-schicht (26), die einander gegenüber sind, und nur eine erste Isolierschicht (25), die als einzelne Schicht zwischen der ersten Elektroden-schicht (21, 22) und der zweiten Elektroden-schicht (26) angeordnet ist, aufweist;

wobei der TFT (30) Folgendes aufweist:

eine Gate-Elektrode (31, 32), die das gleiche Material mit der gleichen Dicke wie die erste Elektroden-schicht (21, 22) des Kondensators (20) aufweist, wobei die Gate-Elektrode (31, 32) und die erste Elektroden-schicht (21, 22) direkt auf demselben Element angeordnet sind;

eine zweite Isolierschicht (33), die als Gate-Isolierschicht wirkt und die Gate-Elektrode (31, 32) bedeckt;

eine aktive Schicht (34) auf der zweiten Isolierschicht (33);

eine dritte Isolierschicht (35) auf der aktiven Schicht (34), wobei die dritte Isolierschicht (35) mit der ersten Isolierschicht (25) kontinuierlich ist; und

Source- und Drain-Elektroden (36, 37) auf der dritten Isolierschicht (35), die mit der aktiven Schicht (34) verbunden sind, wobei die Source- und Drain-Elektroden (36, 37) das gleiche Material mit der gleichen Dicke wie die zweite Elektroden-schicht (26) des Kondensators (20) aufweisen.

2. Organische lichtemittierende Anzeigevorrichtung gemäß Anspruch 1, wobei die erste Elektroden-schicht (21, 22) eine transparente Elektroden-schicht (21) auf einem Substrat (10) und eine niederohmige Elektroden-schicht (22) auf der transparenten Elektroden-schicht aufweist.

3. Organische lichtemittierende Anzeigevorrichtung gemäß Anspruch 1 oder 2, wobei die Gate-Elektrode (31, 32) eine transparente Elektroden-schicht (31) auf dem Substrat (10) und eine niederohmige Elektroden-schicht (32) auf der transparenten Elektroden-schicht aufweist.

4. Organische lichtemittierende Anzeigevorrichtung gemäß einem der vorstehenden Ansprüche, wobei die organische lichtemittierende Vorrichtung (40) eine Pixelelektrode (41, 42), die mit dem TFT (30) verbunden ist, eine gegenüberliegende Elektrode gegenüber der Pixelelektrode (41, 42) und eine organische Emissionsschicht (43) zwischen der Pixelelektrode (41, 42) und der gegenüberliegenden Elektrode aufweist.

5. Organische lichtemittierende Anzeigevorrichtung nach Anspruch 4, wobei die Pixelelektrode (41, 42) eine transparente Elektrodenschicht (41) auf dem Substrat (10), die mit der organischen Emissionsschicht (43) verbunden ist, und eine niederohmige Elektrodenschicht (42) auf der transparenten Elektrodenschicht, die mit dem TFT (30) verbunden ist, aufweist.

6. Verfahren zum Herstellen einer organischen lichtemittierenden Anzeigevorrichtung, wobei das Verfahren Folgendes umfasst:

Bilden einer organischen lichtemittierenden Vorrichtung (40);

Bilden eines Dünnschichttransistors (TFT) (30), der elektrisch mit der organischen lichtemittierenden Vorrichtung (40) verbunden ist;

Bilden eines Kondensators (20), der elektrisch mit der organischen lichtemittierenden Vorrichtung (40) verbunden ist, wobei der Kondensator eine erste Elektrodenschicht (21, 22) und eine zweite Elektrodenschicht (26), die einander gegenüber sind, und nur eine erste Isolierschicht (25), die als einzelne Schicht zwischen der ersten Elektrodenschicht (21, 22) und der zweiten Elektrodenschicht (26) angeordnet ist, aufweist; und

Bilden einer Pixelelektrode der organischen lichtemittierenden Vorrichtung, einer Gate-Elektrode des TFT (30) und der ersten Elektrodenschicht (21, 22) des Kondensators (20) einer gleichen Schicht auf einem Substrat (10) direkt auf demselben Element;

Bilden einer zweiten Isolierschicht (22), die als Gate-Isolierschicht wirkt, um die Gate-Elektrode des TFT (30) zu bedecken;

Bilden einer aktiven Schicht (34) auf der zweiten Isolierschicht (22);

Bilden der ersten Isolierschicht (25) auf der ersten Elektrodenschicht (21, 22) des Kondensators (20) und einer dritten Isolierschicht (35) auf der aktiven Schicht (34) einer gleichen kontinuierlichen Schicht; und

Bilden von der zweiten Elektrodenschicht (26) auf der ersten Isolierschicht (25) und Source- und Drain-Elektroden (35) auf der dritten Isolierschicht einer

gleichen Schicht.

7. Verfahren gemäß Anspruch 6, wobei die erste Elektrodenschicht (21, 22), die Gate-Elektrode und die Pixelelektrode (41, 42) jeweils eine transparente Elektrodenschicht, die auf dem Substrat (10) gebildet ist, und eine niederohmige Elektrodenschicht, die auf der transparenten Elektrodenschicht gebildet ist, aufweisen.

8. Verfahren gemäß Anspruch 6 oder 7, ferner umfassend:

Bilden einer organischen Emissionsschicht (43) auf der Pixelelektrode (41, 42); und
Bilden einer gegenüberliegenden Elektrode auf der organischen Emissionsschicht (43).

9. Verfahren gemäß Anspruch 8, wobei die organische Emissionsschicht (43) auf der freiliegenden Pixelelektrode (41) gebildet ist und die Pixelelektrode (41) durch Ätzen einer pixeldefinierenden Schicht, die auf der Pixelelektrode (41) gebildet ist, teilweise freigelegt wird.

Revendications

1. Dispositif d'affichage électroluminescent organique, comprenant :

un dispositif électroluminescent organique (40) ;

un transistor en couches minces (TFT) (30) raccordé électriquement au dispositif électroluminescent organique (40) ; et

un condensateur (20) raccordé électriquement au dispositif électroluminescent organique (40), le condensateur (20) comprenant une première couche formant électrode (21, 22) et une deuxième couche formant électrode (26) opposées l'une à l'autre, et seulement une première couche isolante (25) interposée sous la forme d'une couche unique entre la première couche formant électrode (21, 22) et la deuxième couche formant électrode (26) ;

dans lequel le TFT (30) comprend :

une électrode de grille (31, 32) comprenant le même matériau avec la même épaisseur que la première couche formant électrode (21, 22) du condensateur (20), l'électrode de grille (31, 32) et la première couche formant électrode (21, 22) étant positionnées directement sur le même élément ;

une deuxième couche isolante (33), faisant office de couche isolante de grille, recouvrant

- l'électrode de grille (31, 32) ;
 une couche active (34) positionnée sur la deuxième couche isolante (33) ;
 une troisième couche isolante (35) positionnée sur la couche active (34), la troisième couche isolante (35) se trouvant dans la continuité de la première couche isolante (25) ; et
 des électrodes de source et de drain (36, 37) positionnées sur la troisième couche isolante (35) et raccordées à la couche active (34), les électrodes de source et de drain (36, 37) comprenant le même matériau avec la même épaisseur que la deuxième couche formant électrode (26) du condensateur (20).
2. Dispositif d'affichage électroluminescent organique selon la revendication 1, dans lequel la première couche formant électrode (21, 22) comprend une couche transparente formant électrode (21) positionnée sur un substrat (10), et une couche formant électrode basse résistance (22) positionnée sur la couche transparente formant électrode.
3. Dispositif d'affichage électroluminescent organique selon la revendication 1 ou 2, dans lequel l'électrode de grille (31, 32) comprend une couche transparente formant électrode (31) positionnée sur le substrat (10), et une couche formant électrode basse résistance (32) positionnée sur la couche transparente formant électrode.
4. Dispositif d'affichage électroluminescent organique selon l'une quelconque des revendications précédentes, dans lequel le dispositif électroluminescent organique (40) comprend une électrode de pixel (41, 42) raccordée au TFT (30), une électrode opposée se trouvant face à l'électrode de pixel (41, 42), et une couche d'émission organique (43) interposée entre l'électrode de pixel (41, 42) et l'électrode opposée.
5. Dispositif d'affichage électroluminescent organique selon la revendication 4, dans lequel l'électrode de pixel (41, 42) comprend une couche transparente formant électrode (41) positionnée sur le substrat (10) et raccordée à la couche d'émission organique (43), et une couche formant électrode basse résistance (42) positionnée sur la couche transparente formant électrode et raccordée au TFT (30).
6. Procédé de fabrication d'un dispositif d'affichage électroluminescent organique, le procédé comprenant les étapes consistant à :
- former un dispositif électroluminescent organique (40) ;
 former un transistor en couches minces (TFT) (30) raccordé électriquement au dispositif électroluminescent organique (40) ;
 former un condensateur (20) raccordé électriquement au dispositif électroluminescent organique (40), le condensateur comprenant une première couche formant électrode (21, 22) et une deuxième couche formant électrode (26) opposées l'une à l'autre, et seulement une première couche isolante (25) interposée sous forme de couche unique entre la première couche formant électrode (21, 22) et la deuxième couche formant électrode (26) ; et
 former une électrode de pixel du dispositif électroluminescent organique, une électrode de grille du TFT (30), et la première couche formant électrode (21, 22) du condensateur (20) d'une même couche sur un substrat (10), directement sur le même élément ;
- former une deuxième couche isolante (22), faisant office de couche isolante de grille, afin de recouvrir l'électrode de grille du TFT (30) ;
 former une couche active (34) sur la deuxième couche isolante (22) ;
 former la première couche isolante (25) sur la première couche formant électrode (21, 22) du condensateur (20) et une troisième couche isolante (35) sur la couche active (34) d'une même couche dans la continuité ; et
 former la deuxième couche formant électrode (26) sur la première couche isolante (25) et des électrodes de source et de drain (36, 37) sur la troisième couche isolante d'une même couche.
7. Procédé selon la revendication 6, dans lequel chacune parmi la première couche formant électrode (21, 22), l'électrode de grille, et l'électrode de pixel (41, 42) comprend une couche transparente formant électrode formée sur le substrat (10) et une couche formant électrode basse résistance formée sur la couche transparente formant électrode.
8. Procédé selon la revendication 6 ou 7, comprenant en outre les étapes consistant à :
- former une couche d'émission organique (43) sur l'électrode de pixel (41, 42) ; et
 former une électrode faisant face sur la couche d'émission (43).
9. Procédé selon la revendication 8, dans lequel la couche d'émission organique (43) est formée sur l'électrode de pixel (41) exposée, et l'électrode de pixel (41) est partiellement exposée grâce à une étape consistant à graver une couche de définition de pixel formée sur l'électrode de pixel (41).

FIG. 1

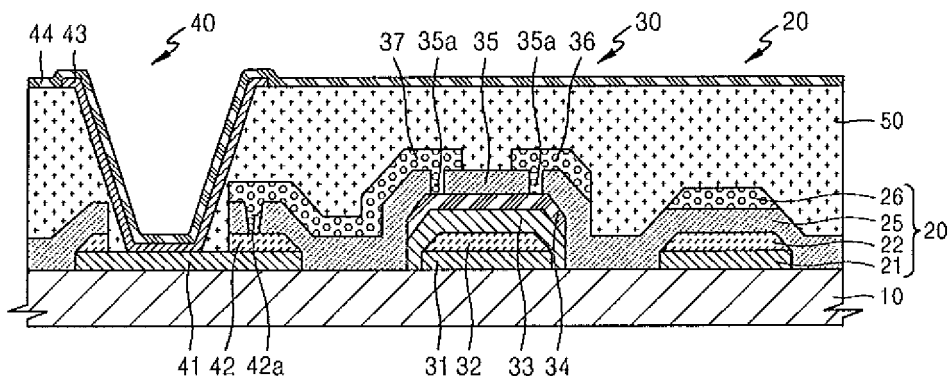


FIG. 2A

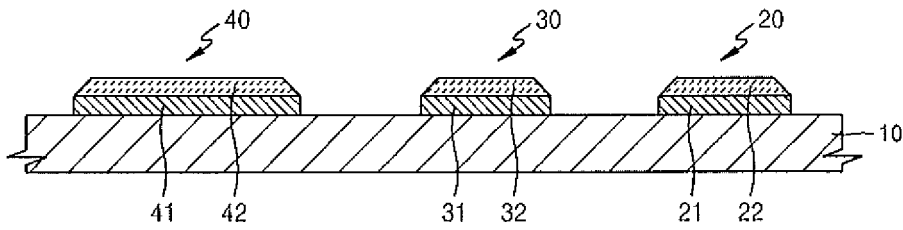


FIG. 2B

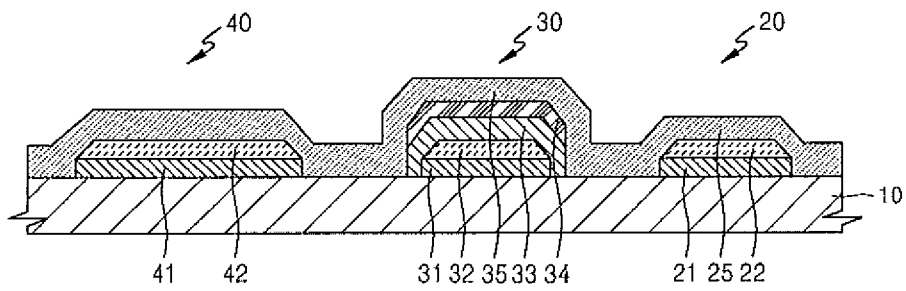


FIG. 2C

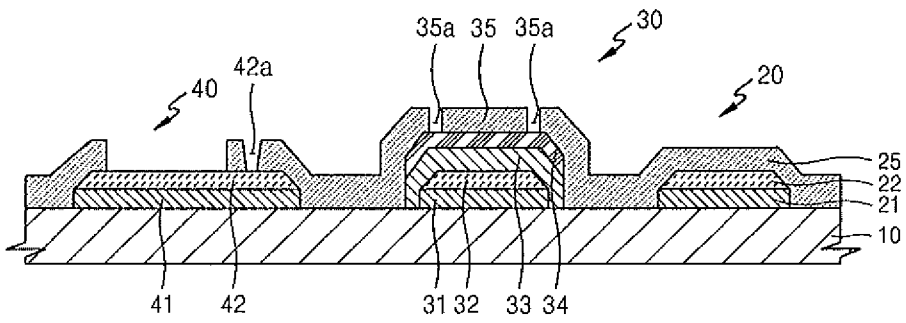


FIG. 2D

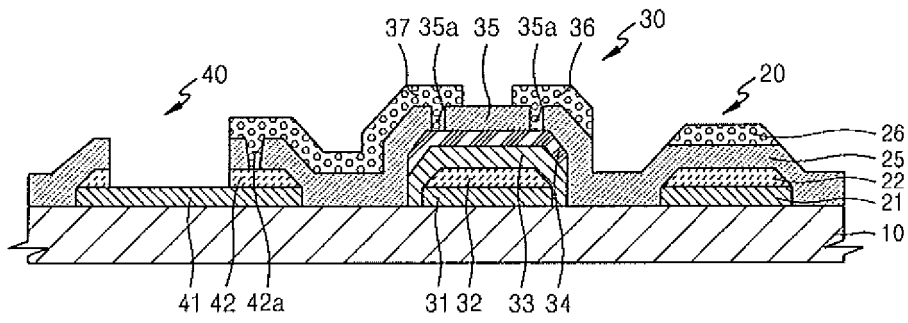


FIG. 2E

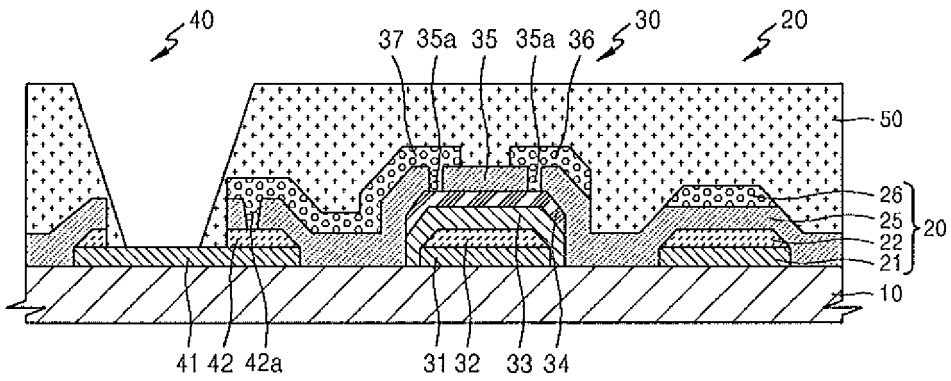
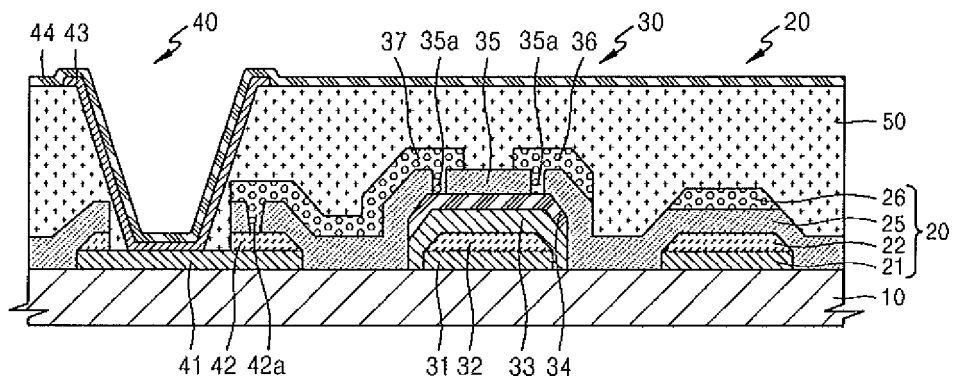


FIG. 2F



REFERENCES CITED IN THE DESCRIPTION

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|----------------|--|---------|------------|
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| 当前申请(专利权)人(译) | 三星DISPLAY CO. , LTD. | | |
| [标]发明人 | PARK SANG IL CHOI CHAUN GI AHN TAE KYUNG | | |
| 发明人 | PARK, SANG-IL CHOI, CHAUN-GI AHN, TAE-KYUNG | | |
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| 其他公开文献 | EP2500946A2 EP2500946A3 | | |
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摘要(译)

有机发光显示装置包括有机发光装置，电连接到有机发光装置的薄膜晶体管（TFT），以及电连接到有机发光装置的电容器，该电容器包括第一有机发光装置电极层和第二电极层彼此相对，并且第一绝缘层作为单层插入在第一电极层和第二电极层之间。

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(54) **Organic light-emitting display and method of manufacturing the same**
Organische Leucht-emittierende Anzeige und Verfahren zu ihrer Herstellung
Affichage électroluminescent organique et son procédé de fabrication

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(73) Applicant: **Samsung Display Co., Ltd.**
Gyeonggi-do (KR)

(72) Inventors:
* **Park, Sang-Il**
* **Choi, Chaun-Gi**
* **Ahn, Tae-Kyung**

(74) Representing: **Abbotsmerry, Simon James Marks & Clerk LLP**
90 Long Acre
London
WC2E 9BA (GB)

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