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Im et al.

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(54) **ORGANIC LIGHT EMITTING DISPLAY
DEVICE AND METHOD OF
MANUFACTURING THE SAME**

(58) **Field of Classification Search**

None

See application file for complete search history.

(71) Applicant: **LG DISPLAY CO., LTD.**, Seoul (KR)

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Primary Examiner — Lex Malsawma

(21) Appl. No.: **15/166,970**

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Oct. 30, 2015 (KR) 10-2015-0152626

(51) **Int. Cl.**

H01L 27/32 (2006.01)

H01L 51/52 (2006.01)

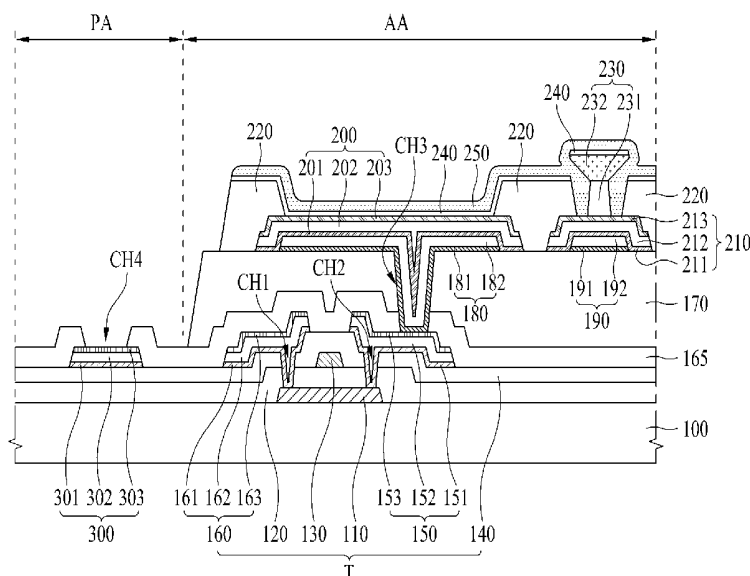
(52) **U.S. Cl.**

CPC **H01L 27/3246** (2013.01); **H01L 27/3276** (2013.01); **H01L 51/5228** (2013.01); **H01L 51/5237** (2013.01); **H01L 2251/5315** (2013.01)

(57) **ABSTRACT**

Discussed is an organic light emitting display device that may include an active area and a pad area on a substrate, wherein the active area includes an anode electrode, an organic emitting layer, a cathode electrode, and an auxiliary electrode connected with the cathode electrode and provided in the same layer as the anode electrode, and the pad area includes a signal pad, and a passivation layer for covering a lateral surface of the signal pad, wherein the passivation layer has a contact hole for exposing an upper surface of the signal pad. Also, the signal pad includes a lower signal pad, a central signal pad and an upper signal pad, and the central signal pad is surrounded by the lower signal pad, the upper signal pad and the passivation layer.

17 Claims, 12 Drawing Sheets



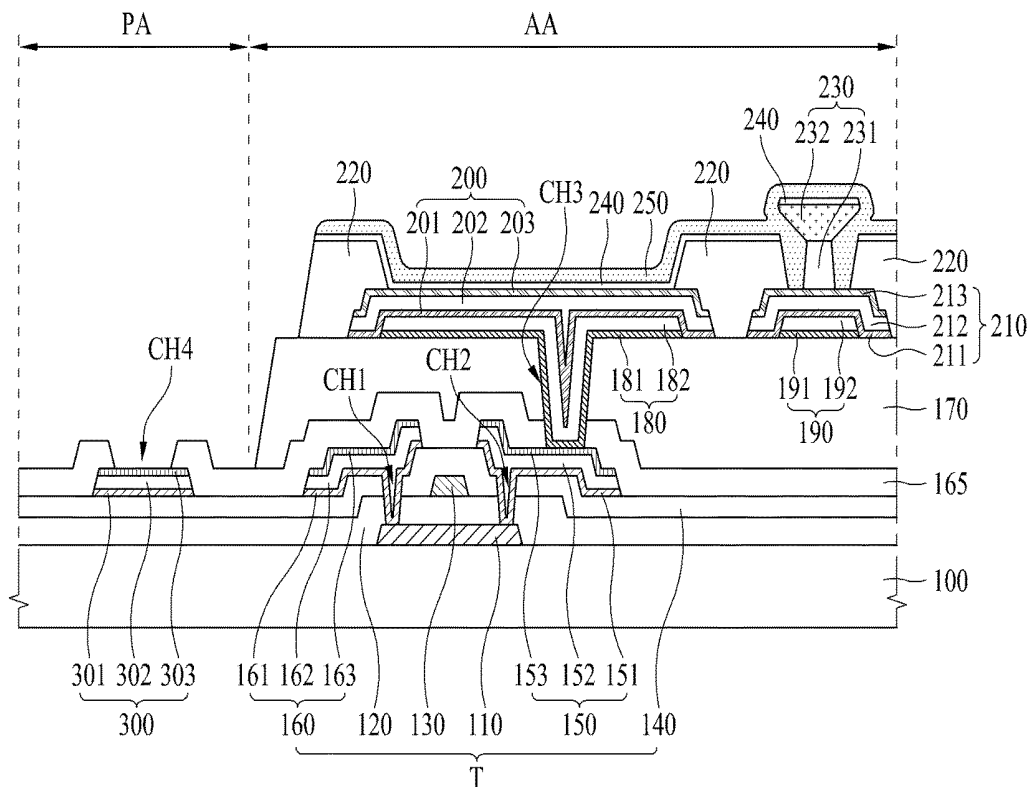


FIG. 4B

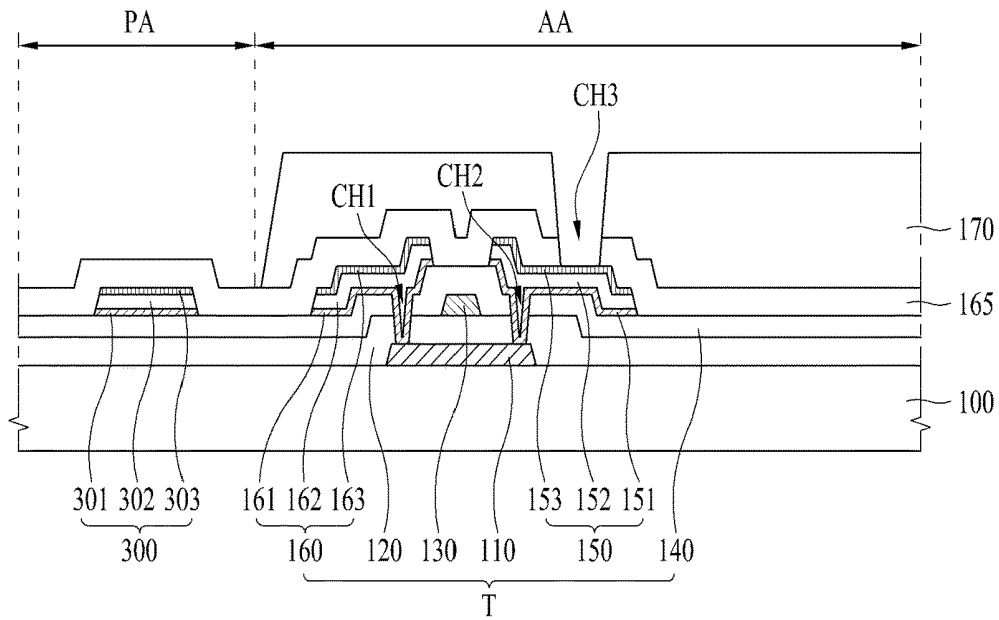


FIG. 4C

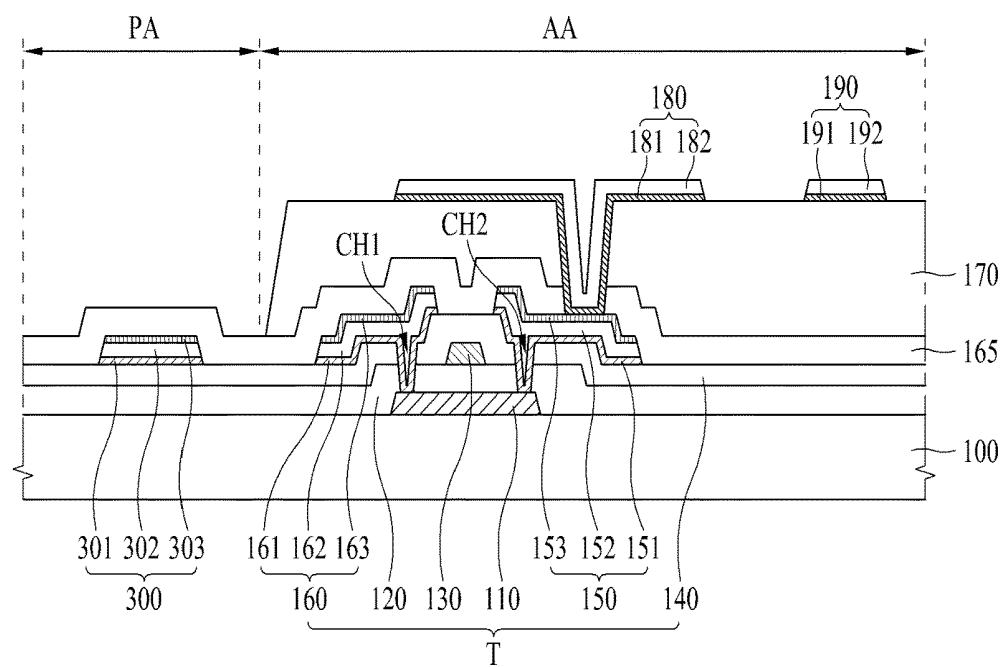


FIG. 4D

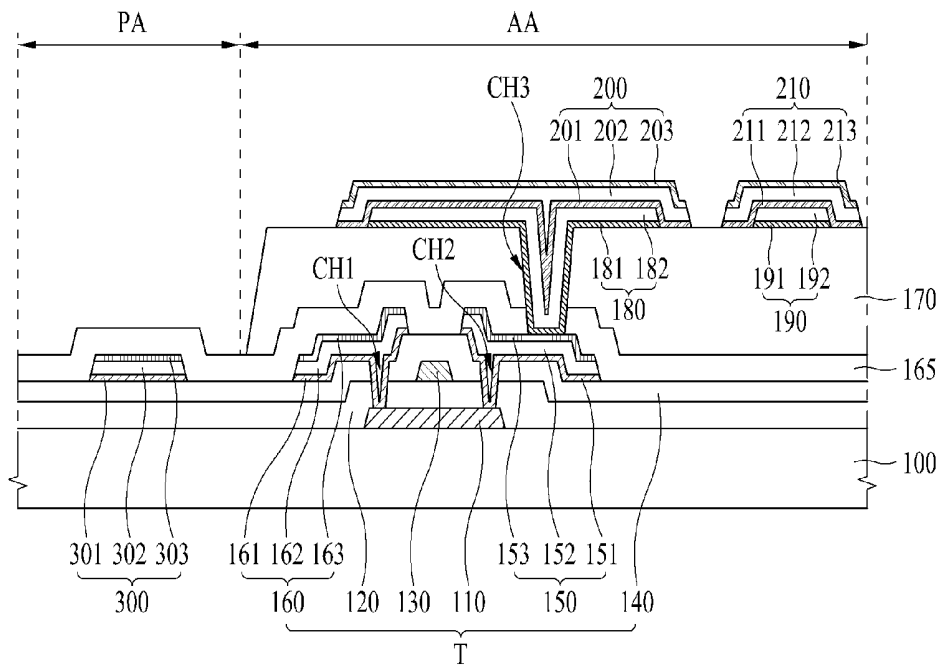


FIG. 4E

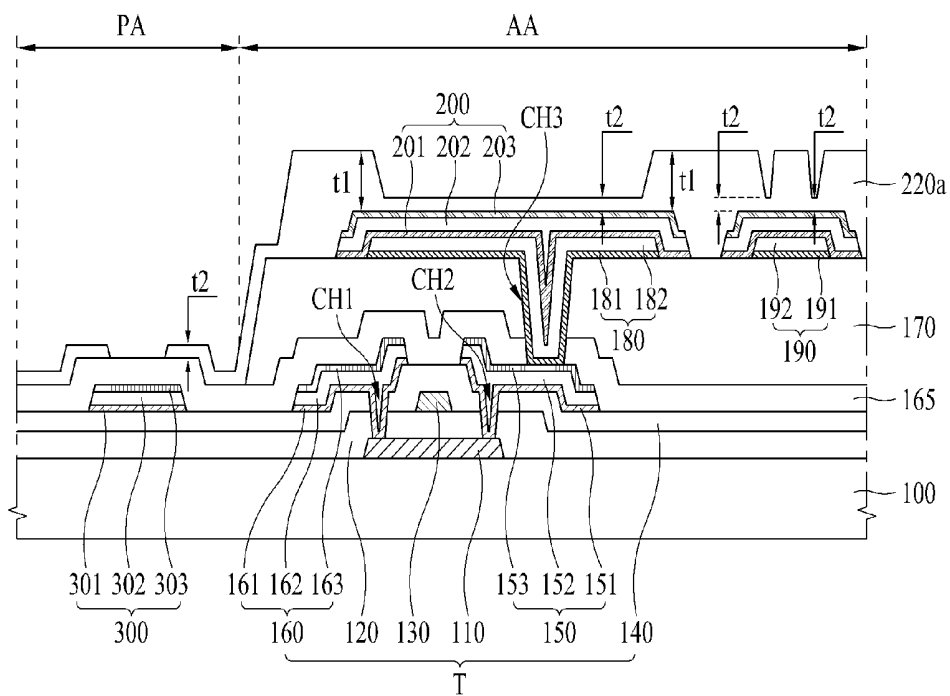


FIG. 4F

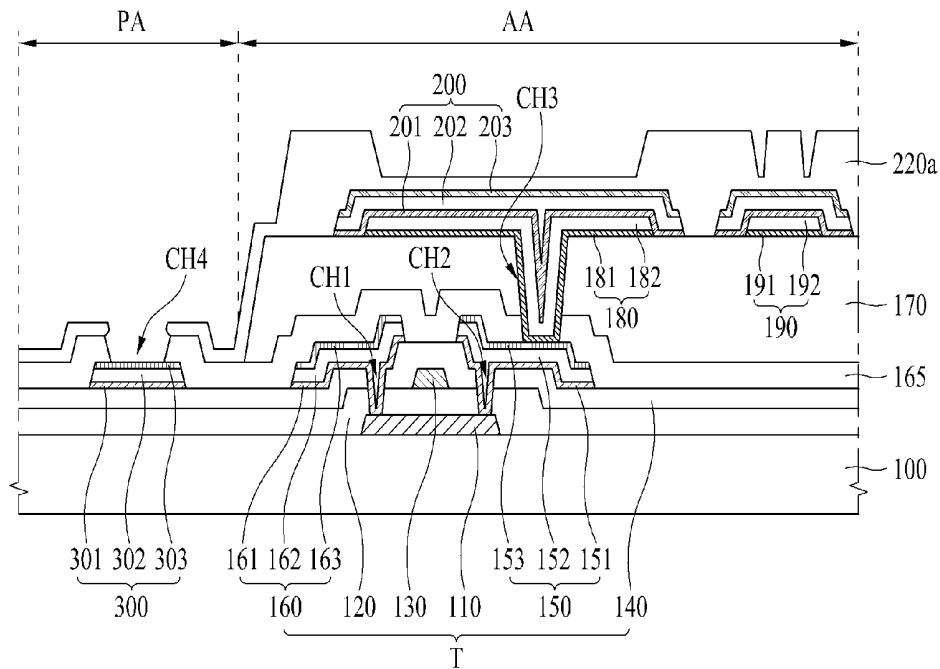


FIG. 4G

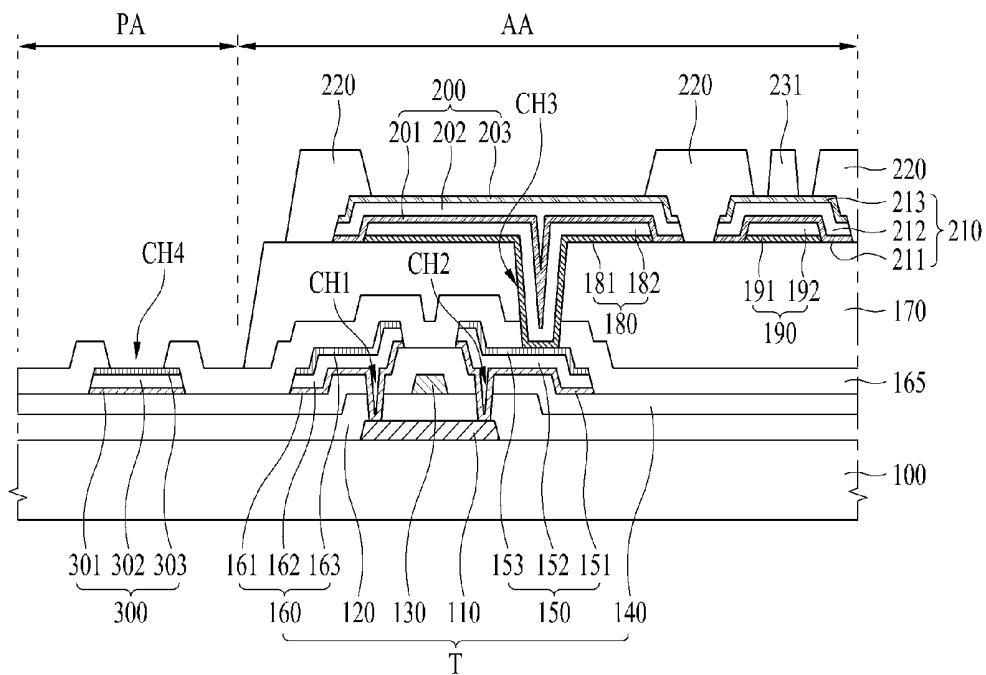


FIG. 4H

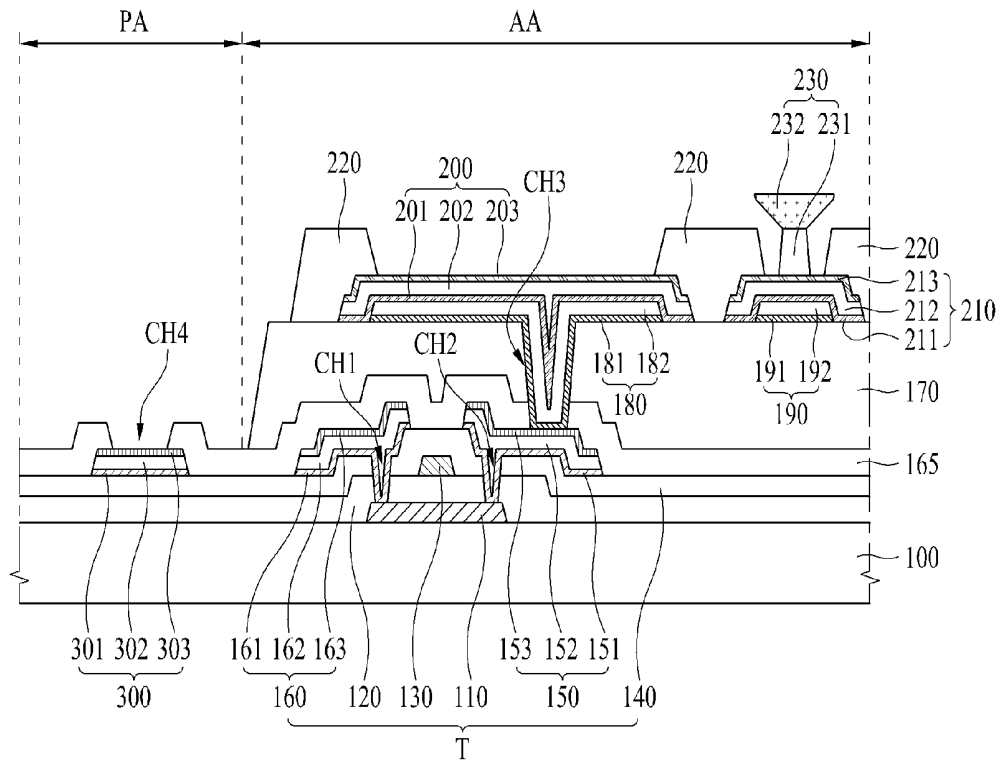


FIG. 4I

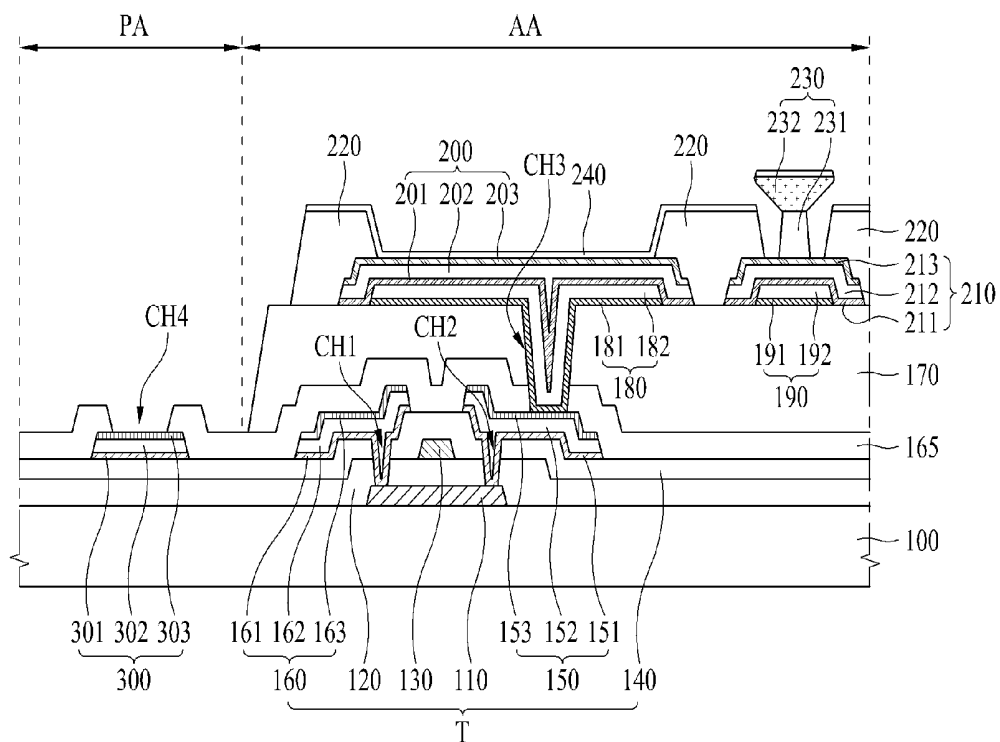


FIG. 4J

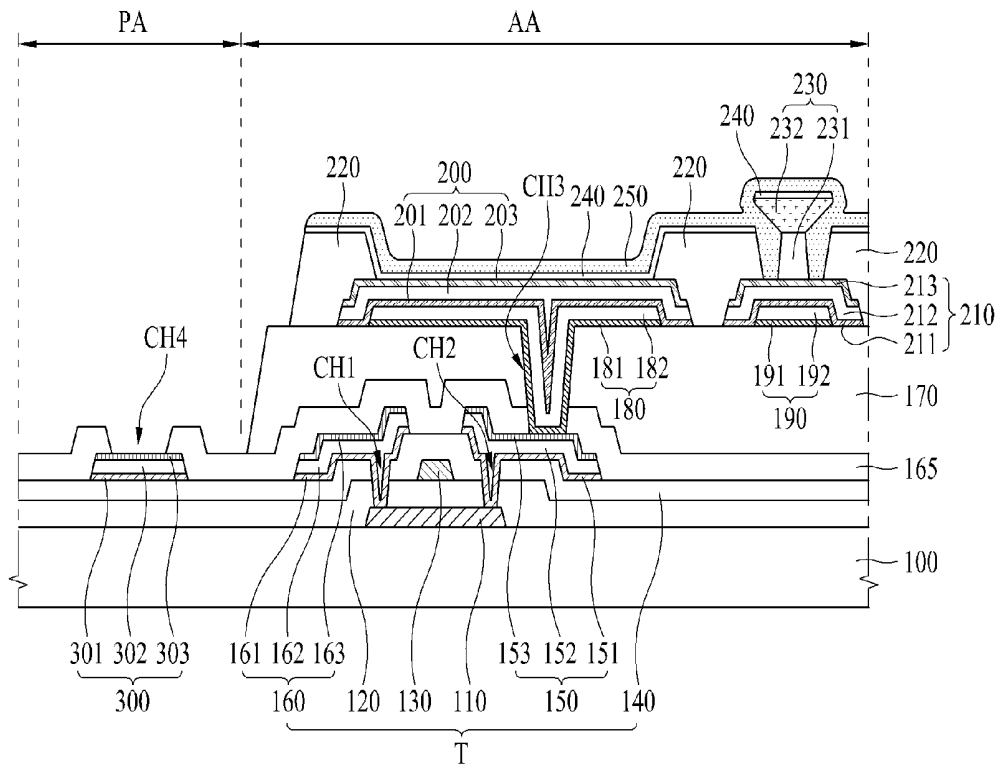


FIG. 5A

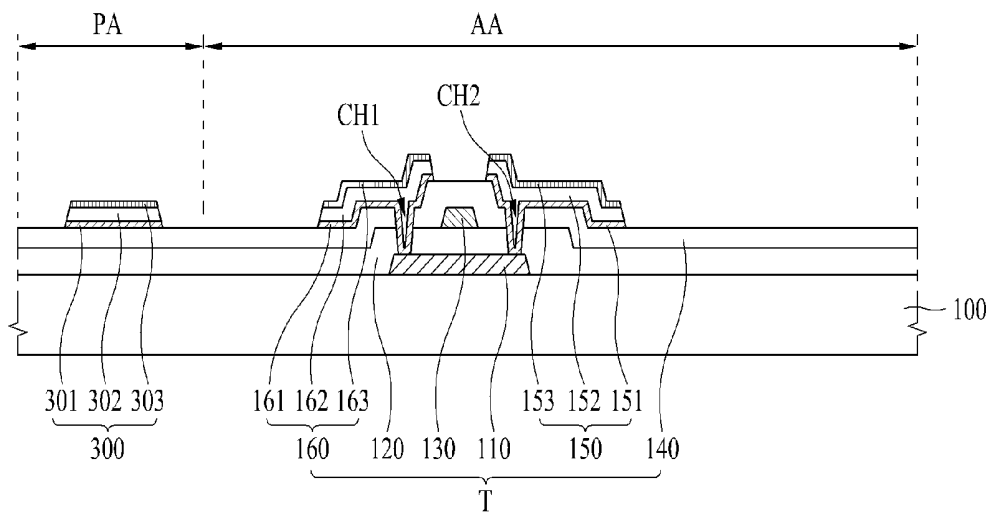


FIG. 5B

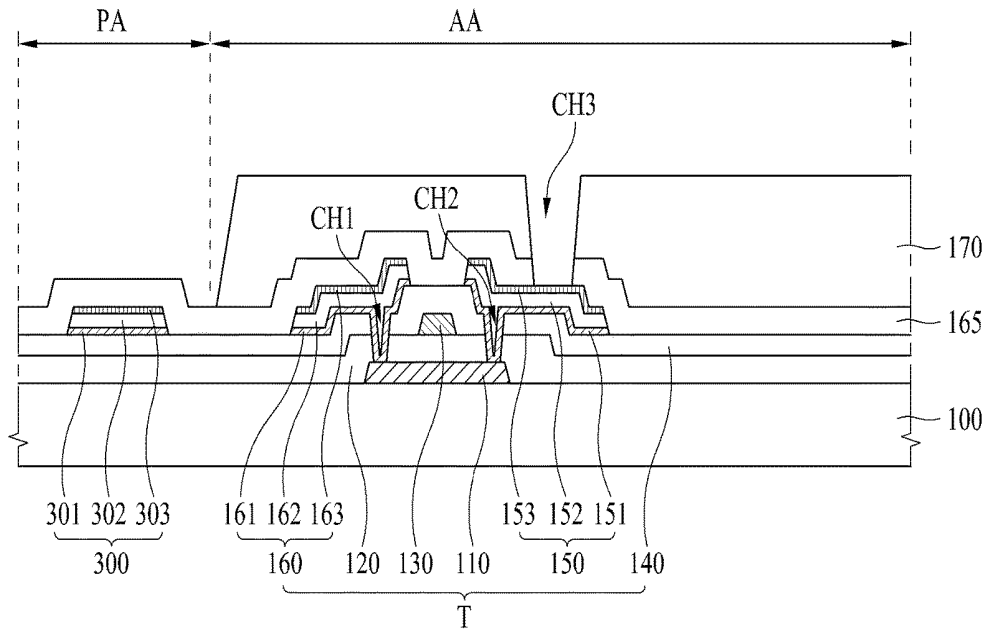


FIG. 5C

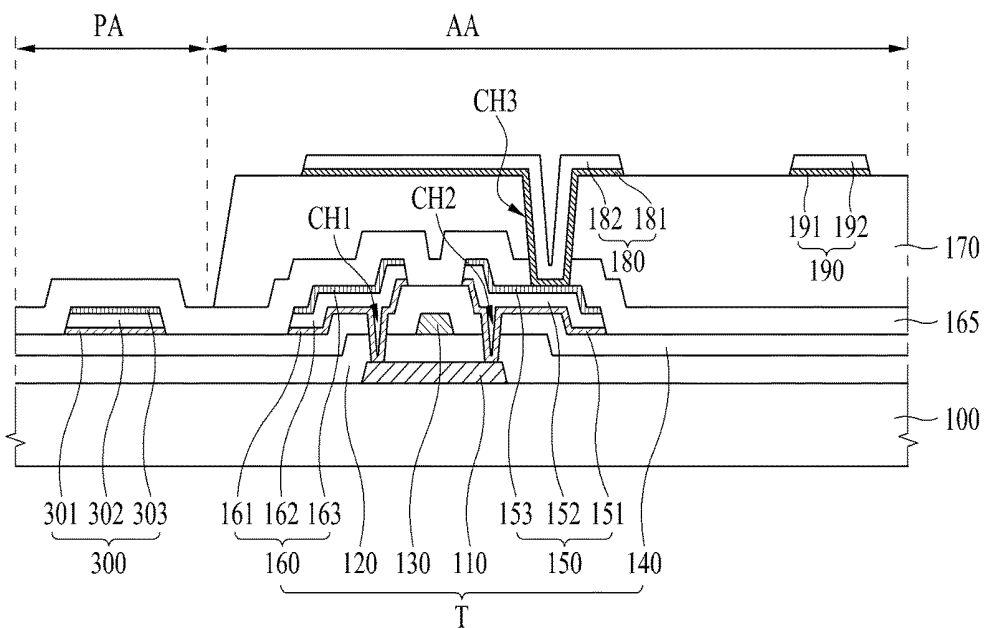


FIG. 5D

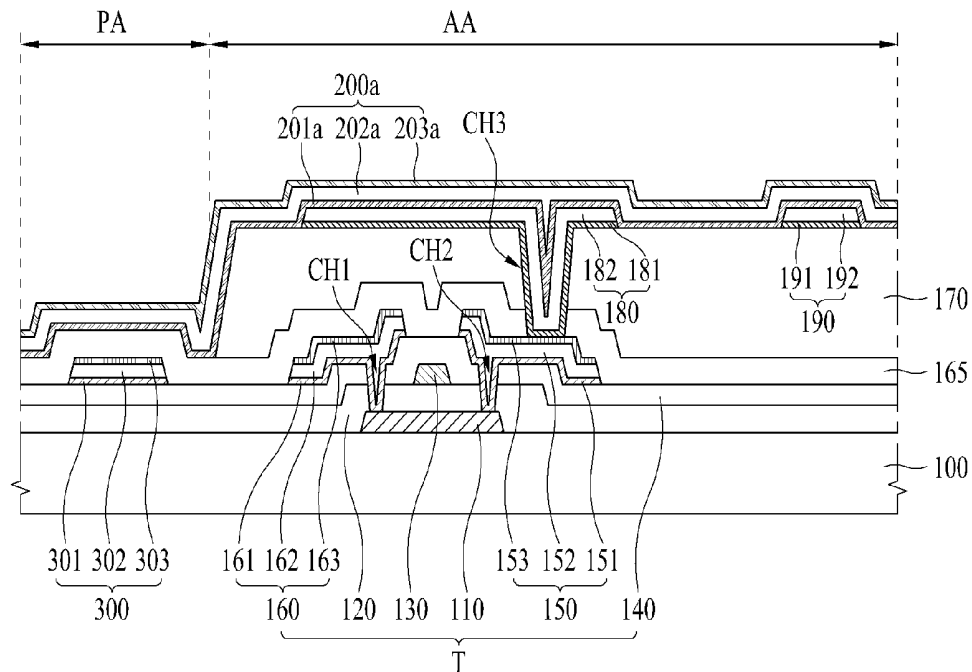


FIG. 5E

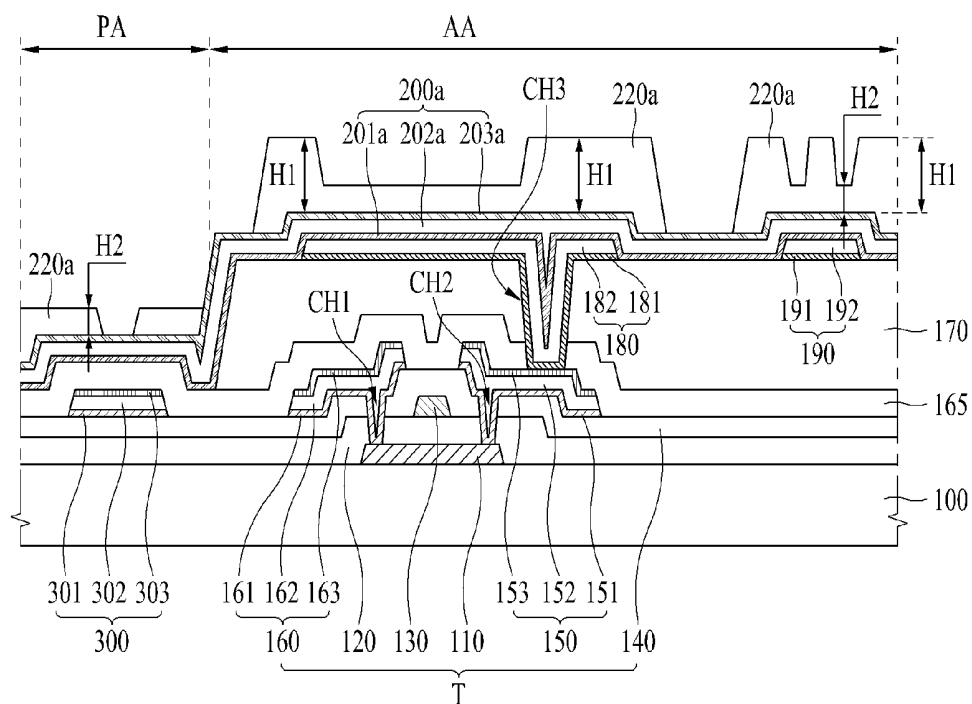


FIG. 5F

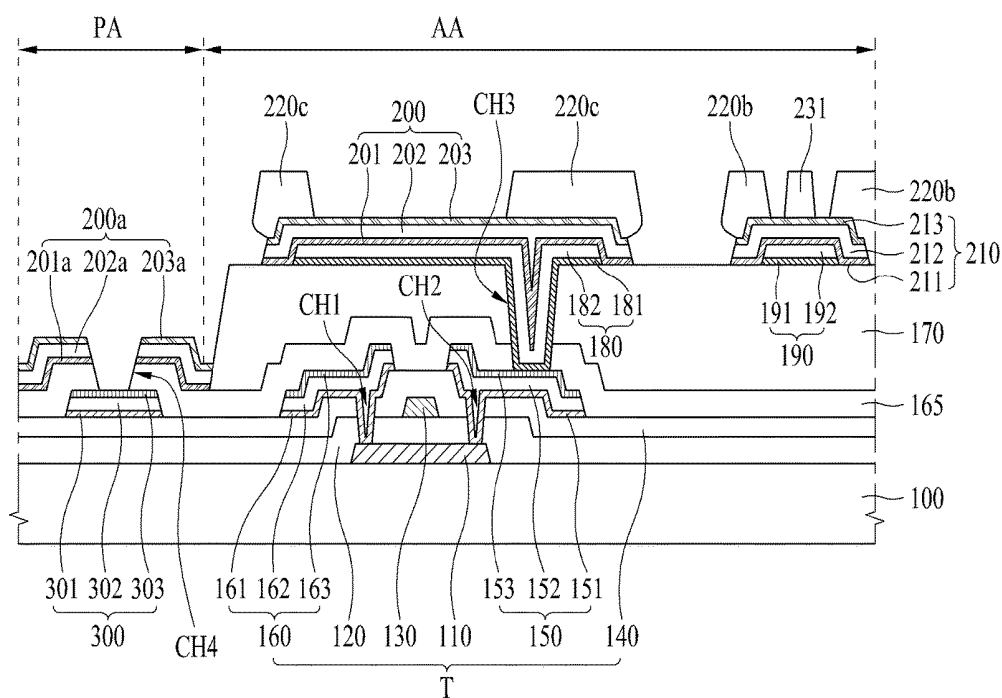


FIG. 5G

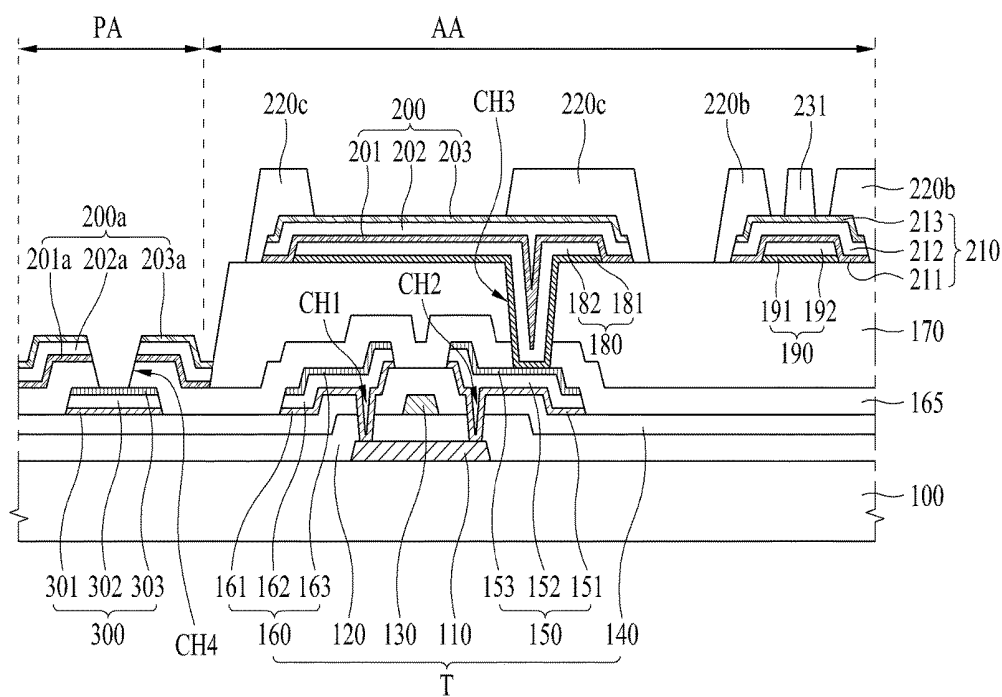


FIG. 5H

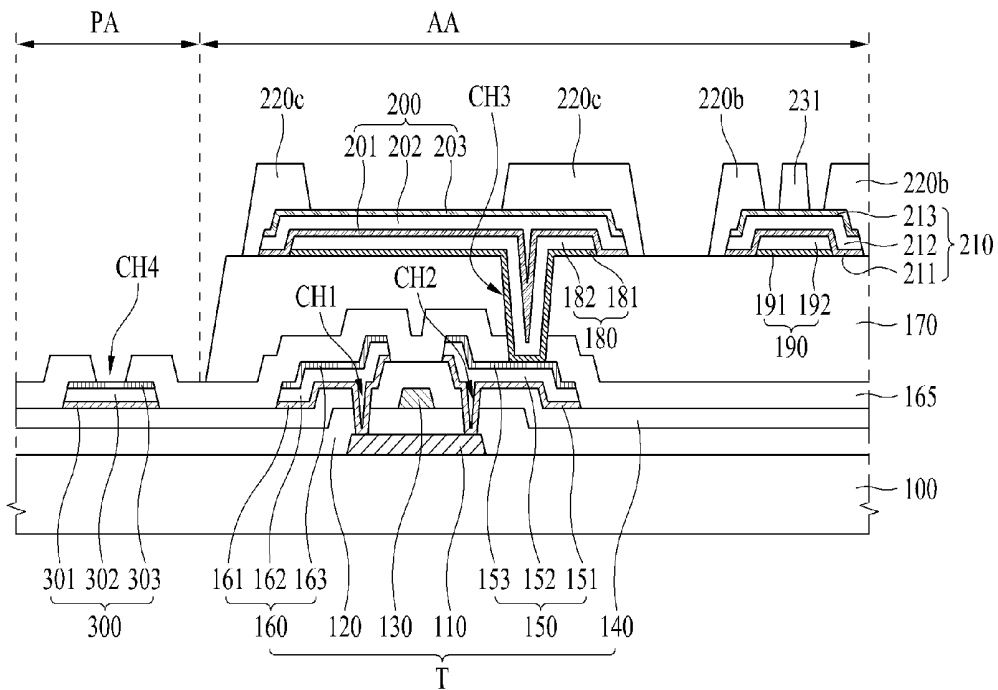


FIG. 5I

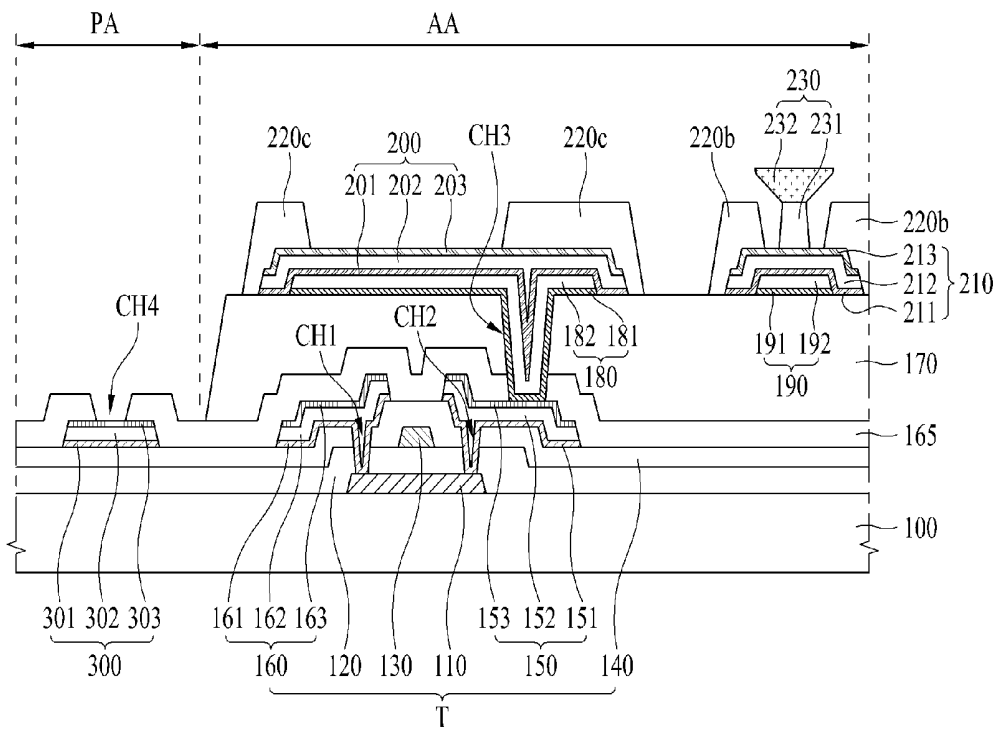


FIG. 5J

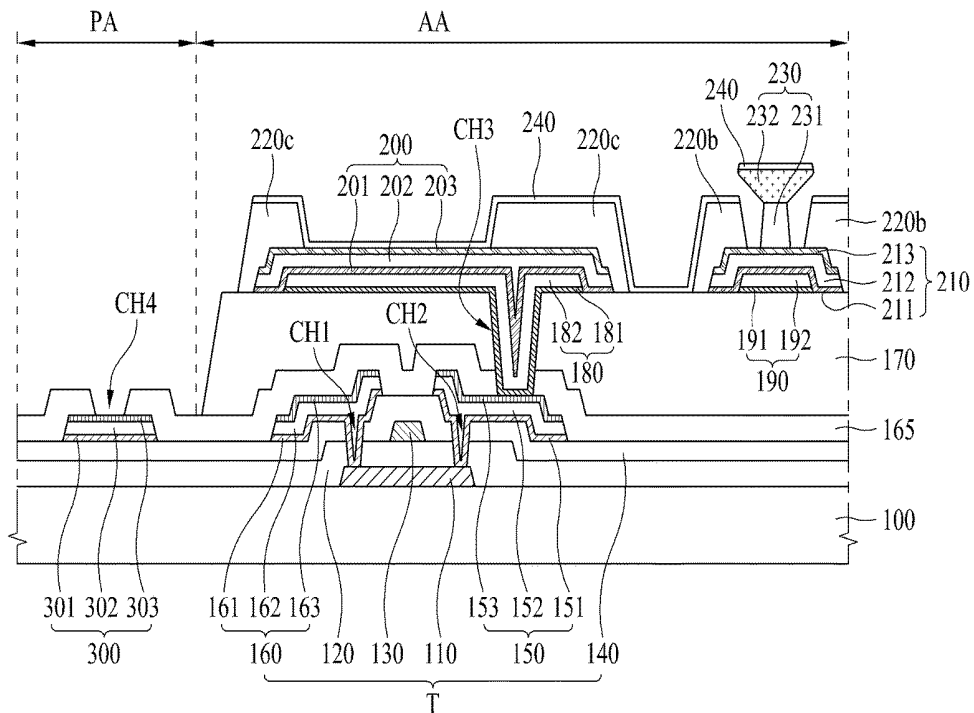
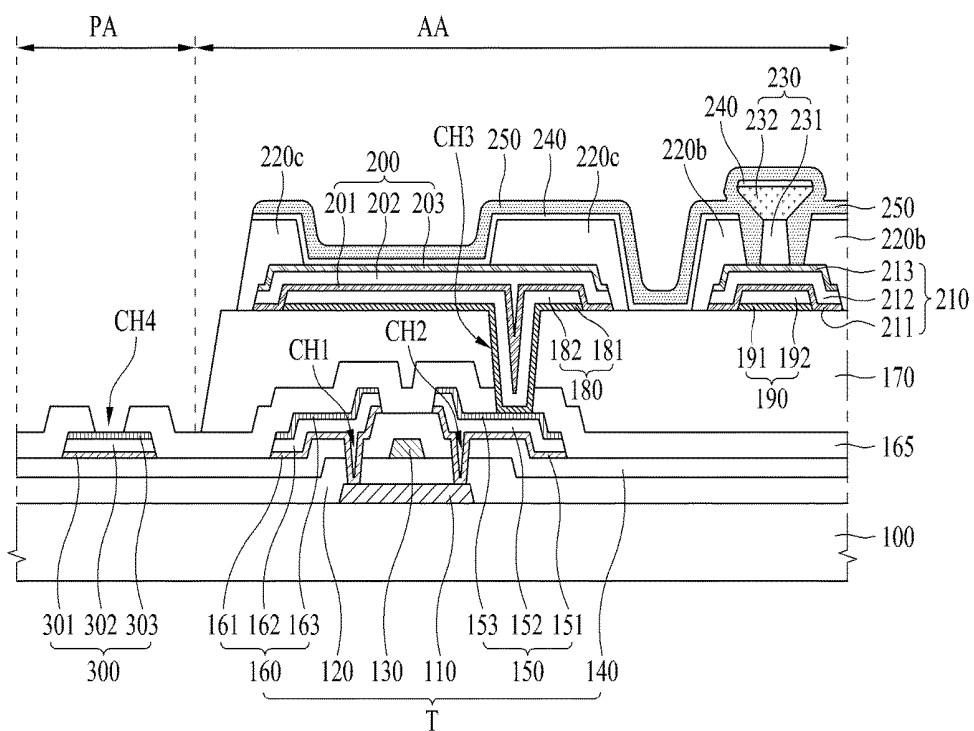


FIG. 5K



ORGANIC LIGHT EMITTING DISPLAY DEVICE AND METHOD OF MANUFACTURING THE SAME

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims the priority benefit of the Korean Patent Application No. 10-2015-0075394 filed on May 28, 2015 and the Korean Patent Application No. 10-2015-0152626 filed on Oct. 30, 2015, all of which are hereby incorporated by reference as if fully set forth herein.

BACKGROUND

Field of the Disclosure

Embodiments of the present invention relate to an organic light emitting display device, and more particularly, to a top emission type organic light emitting display device, and a method of manufacturing the same.

Discussion of the Related Art

An organic light emitting display (OLED) device, which is a self light emitting display device, has advantages of low power consumption, rapid response speed, high emission efficiency, high luminance and wide viewing angle.

According to a direction of light emitted from an organic light emitting device, the OLED device may be largely classified into a top emission type and a bottom emission type. In case of the bottom emission type, a circuit device is disposed between an emitting layer and an image displaying surface, whereby an aperture ratio may be lowered due to the circuit device. Meanwhile, in case of the top emission type, a circuit device is not disposed between an emitting layer and an image displaying surface, whereby an aperture ratio may be improved.

FIG. 1 is a cross sectional view of a related art top emission type OLED device.

As shown in FIG. 1, a thin film transistor layer (T) including an active layer 11, a gate insulating film 12, a gate electrode 13, an insulating interlayer 14, a source electrode 15 and a drain electrode 16 is provided on an active area (AA) of a substrate 10, and then a passivation layer 20 and a planarization layer 30 are sequentially provided on the thin film transistor layer (T).

Also, an anode electrode 40 and an auxiliary electrode 50 are provided on the planarization layer 30. The auxiliary electrode 50 is provided to lower a resistance of a cathode electrode 80 to be explained later.

On the anode electrode 40 and the auxiliary electrode 50, a bank 60 is provided to define a pixel region. Also, an organic emitting layer 70 is provided in the pixel region defined by the bank 60, and the cathode electrode 80 is provided on the organic emitting layer 70.

In case of the top emission type, light emitted from the organic emitting layer 70 passes through the cathode electrode 80. In this reason, the cathode electrode 80 is formed of a transparent conductive material, which causes the increase of resistance therein. In order to lower the resistance of the cathode electrode 80, the cathode electrode 80 is connected with the auxiliary electrode 50.

On a pad area (PA) of the substrate 10, there are the gate insulating film 12 and the insulating interlayer 14. A signal pad 90 is provided on the insulating interlayer 14, and the passivation layer 20 is provided on the signal pad 90. A contact hole is provided in the passivation layer 20 so that the signal pad 90 is exposed to the external via the contact

hole. A pad electrode 95 is provided on the passivation layer 20. The pad electrode 95 is connected with the signal pad 90 exposed via the contact hole.

However, the related art top emission type organic light emitting display device may have the following disadvantages.

The pad electrode 95 is manufactured for a process of manufacturing the anode electrode 40, whereby the pad electrode 95 is formed of the same material as that of the anode electrode 40. In this case, the anode electrode 40 is formed of a metal material with good reflectance, for example, argentums (Ag) so as to reflect the light emitted from the organic emitting layer 70 toward the cathode electrode 80. However, the metal material with good reflectance, for example, argentums (Ag) is vulnerable to corrosion. A lateral side of the anode electrode 40 is covered by the bank 60, and an upper surface of the anode electrode 40 is covered by the organic emitting layer 70, so that it is possible to prevent the anode electrode 40 from being corroded. However, the pad electrode 95 is exposed to the external, and connected with an external driver, whereby the pad electrode 95 is corroded.

Further, in order to prevent the corrosion, an upper surface of the pad electrode 95 may be formed of a corrosion-resistant material. Even in this case, it is difficult to prevent a lateral side of the pad electrode 95 from being corroded.

SUMMARY

Accordingly, the embodiments of the present invention are directed to a top emission type organic light emitting display device that substantially obviates one or more problems due to limitations and disadvantages of the related art.

An aspect of the embodiments of the present invention is directed to provide a top emission type organic light emitting display device which is capable of preventing a pad electrode from being corroded, and a method of manufacturing the same.

In order to achieve the above purpose, the organic light emitting display device according to one embodiment of the present invention includes an active area and a pad area on a substrate, wherein the active area includes an anode electrode, an organic emitting layer, a cathode electrode, and an auxiliary electrode connected with the cathode electrode and provided in the same layer as the anode electrode, and the pad area includes a signal pad, and a passivation layer for covering a lateral surface of the signal pad, wherein the passivation layer has a contact hole for exposing an upper surface of the signal pad. The signal pad includes a lower signal pad, a central signal pad, and an upper signal pad. The central signal pad is surrounded by the lower signal pad, the upper signal pad, and the passivation layer.

Also, the organic light emitting display device according to one embodiment of the present invention is manufactured by providing a source electrode, a drain electrode and a signal pad on a substrate; providing a passivation layer on the source electrode, the drain electrode and the signal pad, providing a planarization layer on the passivation layer, and providing a contact hole for exposing the source electrode or drain electrode by removing predetermined portions of the passivation layer and the planarization layer; providing a first anode electrode connected with the source electrode or drain electrode, and providing a first auxiliary electrode spaced apart from the first anode electrode; providing a second anode electrode for covering upper and lateral surfaces of the first anode electrode, and providing a second auxiliary electrode for covering upper and lateral surfaces of

the first auxiliary electrode; providing a contact hole for exposing the signal pad by removing a predetermined portion of the passivation layer; providing a bank on one side and the other side of the second anode electrode and one side and the other side of the second auxiliary electrode; providing an organic emitting layer on the second anode electrode; and providing a cathode electrode connected with the second auxiliary electrode on the organic emitting layer.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of embodiments of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of embodiments of the invention. In the drawings:

FIG. 1 is a cross sectional view illustrating a related art top emission type organic light emitting display device;

FIG. 2 is a cross sectional view illustrating an organic light emitting display device according to one embodiment of the present invention;

FIG. 3 is a cross sectional view illustrating an organic light emitting display device according to another embodiment of the present invention;

FIGS. 4A to 4J are cross sectional views illustrating a method of manufacturing the organic light emitting display device according to one embodiment of the present invention; and

FIGS. 5A to 5K are cross sectional views illustrating a method of manufacturing the organic light emitting display device according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Reference will now be made in detail to the exemplary embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts. Advantages and features of the present invention, and implementation methods thereof will be clarified through following embodiments described with reference to the accompanying drawings. The present invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the present invention to those skilled in the art. Further, the present invention is only defined by scopes of claims.

A shape, a size, a ratio, an angle, and a number disclosed in the drawings for describing embodiments of the present invention are merely an example, and thus, the present invention is not limited to the illustrated details. Like reference numerals refer to like elements throughout. In the following description, when the detailed description of the relevant known function or configuration is determined to unnecessarily obscure the important point of the present invention, the detailed description will be omitted. In a case where 'comprise', 'have', and 'include' described in the present specification are used, another part may be added unless 'only~' is used. The terms of a singular form may include plural forms unless referred to the contrary.

In construing an element, the element is construed as including an error region although there is no explicit description.

In description of embodiments of the present invention, when a structure is described as being formed at an upper portion/lower portion of another structure or on/under the other structure, this description should be construed as including a case where the structures contact each other and moreover, a case where a third structure is disposed therebetween.

In describing a time relationship, for example, when the temporal order is described as 'after', 'subsequent', 'next~', and 'before~', a case which is not continuous may be included unless 'just' or 'direct' is used.

It will be understood that, although the terms "first", "second", etc. may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another. For example, a first element could be termed a second element, and, similarly, a second element could be termed a first element, without departing from the scope of the present invention.

Features of various embodiments of the present invention may be partially or overall coupled to or combined with each other, and may be variously inter-operated with each other and driven technically as those skilled in the art can sufficiently understand. The embodiments of the present invention may be carried out independently from each other, or may be carried out together in co-dependent relationship.

Hereinafter, an organic light emitting display device according to embodiments of the present invention will be described in detail with reference to the accompanying drawings.

FIG. 2 is a cross sectional view illustrating an organic light emitting display device according to one embodiment of the present invention. All the components of the organic light emitting display device according to all embodiments of the present invention are operatively coupled and configured.

As shown in FIG. 2, the organic light emitting display device according to one embodiment of the present invention may include an active area (AA) and a pad area (PA) on a substrate 100.

In the active area (AA) of the substrate 100, there are a thin film transistor layer (T), a passivation layer 165, a planarization layer 170, a first anode electrode 180, a second anode electrode 200, a first auxiliary electrode 190, a second auxiliary electrode 210, a bank 220, a partition 230, an organic emitting layer 240, and a cathode electrode 250.

The thin film transistor layer (T) may include an active layer 110, a gate insulating film 120, a gate electrode 130, an insulating interlayer 140, a source electrode 150, and a drain electrode 160.

The active layer 110 is provided on the substrate 100, wherein the active layer 110 overlaps with the gate electrode 130. The active layer 110 may be formed a silicon-based semiconductor material or oxide-based semiconductor material. A light shielding layer may be additionally provided between the substrate 100 and the active layer 110. In this case, external light, which is incident on a lower surface of the substrate 100, is blocked by the light shielding layer so that it is possible to prevent the active layer 110 from being damaged by the external light.

The gate insulating film 120 is provided on the active layer 110. The gate insulating film 120 insulates the active layer 110 and the gate electrode 130 from each other. For example, the gate insulating film 120 may be formed of an

inorganic insulating material, and more particularly, the gate insulating film 120 may be formed in a single-layered structure of the inorganic insulating material such as silicon oxide (SiOx) or silicon nitride (SiNx), or a multi-layered structure of the above silicon oxide (SiOx) and silicon nitride (SiNx), but is not limited to these structures. The gate insulating film 120 may extend to the pad area (PA).

The gate electrode 130 is provided on the gate insulating film 120. The gate electrode 130 overlaps with the active layer 110, and the gate insulating film 120 is interposed between the gate electrode 130 and the active layer 110 being overlapped with each other. The gate electrode 130 may be formed in a single-layered structure or multi-layered structure among molybdenum (Mo), aluminum (Al), chrome (Cr), aurum (Au), titanium (Ti), nickel (Ni), neodymium (Nd), copper (Cu) and their alloys, but is not limited to these materials.

The insulating interlayer 140 is provided on the gate electrode 130. The insulating interlayer 140 is formed of the same material as that of the gate insulating film 120. For example, the insulating interlayer 140 may be formed in a single-layered structure of the inorganic insulating material such as silicon oxide (SiOx) or silicon nitride (SiNx), or a multi-layered structure of the above silicon oxide (SiOx) and silicon nitride (SiNx), but is not limited to these materials and structures. The insulating interlayer 140 may extend to the pad area (PA).

The source electrode 150 and the drain electrode 160 confronting each other are provided on the insulating interlayer 140. A first contact hole (CH1) for exposing one end of the active layer 110 is provided in the aforementioned gate insulating film 120 and the insulating interlayer 140, and a second contact hole (CH2) for exposing the other end of the active layer 110 is provided in the aforementioned gate insulating film 120 and the insulating interlayer 140. The source electrode 150 is connected with the other end of the active layer 110 via the second contact hole (CH2), and the drain electrode 160 is connected with one end of the active layer 110 via the first contact hole (CH1).

The source electrode 150 may include a lower source electrode 151, a central source electrode 152, and an upper source electrode 153.

The lower source electrode 151 is provided between the insulating interlayer 140 and the central source electrode 152, wherein the lower source electrode 151 enhances an adhesive strength between the insulating interlayer 140 and the central source electrode 152. Also, the lower source electrode 151 protects a lower surface of the central source electrode 152 so that it is possible to prevent the lower surface of the central source electrode 152 from being corroded. Thus, an oxidation degree of the lower source electrode 151 may be lower than an oxidation degree of the central source electrode 152. That is, a corrosion resistance in a material of the lower source electrode 151 may be superior to a corrosion resistance in a material of the central source electrode 152. The lower source electrode 151 functions as an adhesion enhancement layer or a corrosion preventing layer. The lower source electrode 151 may be formed of an alloy (MoTi) of molybdenum and titanium, but is not limited to this material.

The central source electrode 152 is provided between the lower source electrode 151 and the upper source electrode 153. The central source electrode 152 may be formed of a low-resistance metal material such as copper (Cu), but is not limited to this metal material. The central source electrode 152 may be formed of a metal material whose resistance is relatively lower than that of the lower source electrode 151

and the upper source electrode 153. In order to lower a total resistance of the source electrode 150, a thickness of the central source electrode 152 is larger than a thickness of each of the lower source electrode 151 and the upper source electrode 153, preferably.

The upper source electrode 153 is provided on an upper surface of the central source electrode 152, wherein the upper source electrode 153 prevents the upper surface of the central source electrode 152 from being corroded. Thus, an oxidation degree of the upper source electrode 153 may be lower than an oxidation degree of the central source electrode 152. That is, a corrosion resistance in a material of the upper source electrode 153 may be superior to a corrosion resistance in a material of the central source electrode 152. The upper source electrode 153 may be formed of a transparent conductive material, for example, indium-tin oxide (ITO), but is not limited to this material.

In the same way as the aforementioned source electrode 150, the drain electrode 160 may include a lower drain electrode 161, a central drain electrode 162, and an upper drain electrode 163.

The lower drain electrode 161 is provided between the insulating interlayer 140 and the central drain electrode 162, wherein the lower drain electrode 161 enhances an adhesive strength between the insulating interlayer 140 and the central drain electrode 162. Also, the lower drain electrode 161 prevents a lower surface of the central drain electrode 162 from being corroded. Thus, an oxidation degree of the lower drain electrode 161 may be lower than an oxidation degree of the central drain electrode 162. That is, a corrosion resistance in a material of the lower drain electrode 161 may be superior to a corrosion resistance in a material of the central drain electrode 162. The lower drain electrode 161 may be formed of the same material as that of the aforementioned lower source electrode 151, that is, alloy (MoTi) of molybdenum and titanium, but is not limited to this material.

The central drain electrode 162 is provided between the lower drain electrode 161 and the upper drain electrode 163. The central drain electrode 162 may be formed of the same material as that of the aforementioned central source electrode 152, for example, copper (Cu), but is not limited to this material. The central drain electrode 162 may be formed of a metal material whose resistance is relatively lower than that of the lower drain electrode 161 and the upper drain electrode 163. In order to lower a total resistance of the drain electrode 160, a thickness of the central drain electrode 162 is larger than a thickness of each of the lower drain electrode 161 and the upper drain electrode 163, preferably.

The upper drain electrode 163 is provided on an upper surface of the central drain electrode 162, wherein the upper drain electrode 163 prevents the upper surface of the central drain electrode 162 from being corroded. Thus, an oxidation degree of the upper drain electrode 163 may be lower than an oxidation degree of the central drain electrode 162. That is, a corrosion resistance in a material of the upper drain electrode 163 may be superior to a corrosion resistance in a material of the central drain electrode 162. The upper drain electrode 163 may be formed of a transparent conductive material, for example, indium-tin oxide (ITO), but is not limited to this material.

The upper drain electrode 163 may be formed of the same material as that of the upper source electrode 153, and the upper drain electrode 163 may be formed in the same thickness as that of the upper source electrode 153. The central drain electrode 162 may be formed of the same material as that of the central source electrode 152, and the

central drain electrode **162** may be formed in the same thickness as that of the central source electrode **152**. The lower drain electrode **161** may be formed of the same material as that of the lower source electrode **151**, and the lower drain electrode **161** may be formed in the same thickness as that of the lower source electrode **151**. In this case, the drain electrode **160** and the source electrode **150** may be simultaneously manufactured in the same process.

A structure of the thin film transistor layer (T) is not limited to the above structure, that is, a structure of the thin film transistor layer (T) may be changed to various shapes generally known to those in the art. For example, the drawing shows a top gate structure where the gate electrode **130** is provided on the active layer **110**, but is not necessarily. That is, it is possible to provide a bottom gate structure where the gate electrode **130** is provided below the active layer **110**.

The passivation layer **165** is provided on the thin film transistor layer (T), and more particularly, on upper surfaces of the source electrode **150** and the drain electrode **160**. The passivation layer **165** protects the thin film transistor layer (T). The passivation layer **165** may be formed of an inorganic insulating material, for example, silicon oxide film (SiO_x) or silicon nitride film (SiN_x), but is not limited to these materials. The passivation layer **165** may extend to the pad area (PA).

The planarization layer **170** is provided on the passivation layer **165**. The planarization layer **170** is provided to planarize an upper surface of the substrate **100** with the thin film transistor layer (T). The planarization layer **170** may be formed of an organic insulating material, for example, acrylic resin, epoxy resin, phenolic resin, polyamide resin, polyimide resin, and etc., but is not limited to these materials. The planarization layer **170** may not extend to the pad area (PA).

The first anode electrode **180** and the first auxiliary electrode **190** are provided on the planarization layer **170**. That is, the first anode electrode **180** and the first auxiliary electrode **190** are formed in the same layer. A third contact hole (CH3) for exposing the source electrode **150** is provided in the aforementioned passivation layer **165** and the planarization layer **170**. The source electrode **150** and the first anode electrode **180** are connected with each other via the third contact hole (CH3). If needed, the third contact hole (CH3) may expose the drain electrode **160**, whereby the drain electrode **160** and the first anode electrode **180** may be connected with each other via the third contact hole (CH3).

The first anode electrode **180** may include a first lower anode electrode **181**, and a first upper anode electrode **182**.

The first lower anode electrode **181** is provided between the planarization layer **170** and the first upper anode electrode **182**, wherein the first lower anode electrode **181** enhances an adhesive strength between the planarization layer **170** and the first upper anode electrode **182**. Also, the first lower anode electrode **181** protects a lower surface of the first upper anode electrode **182**, to thereby prevent the lower surface of the first upper anode electrode **182** from being corroded. Thus, an oxidation degree of the first lower anode electrode **181** may be lower than an oxidation degree of the first upper anode electrode **182**. That is, a corrosion resistance in a material of the first lower anode electrode **181** may be superior to a corrosion resistance in a material of the first upper anode electrode **182**. The first lower anode electrode **181** functions as an adhesion enhancement layer or a corrosion preventing layer. The first lower anode electrode **181** may be formed of an alloy (MoTi) of molybdenum and titanium, but is not limited to this material.

The first upper anode electrode **182** is provided on an upper surface of the first lower anode electrode **181**. The first upper anode electrode **182** may be formed of a low-resistance metal material, for example, copper (Cu), but is not limited to this material. The first upper anode electrode **182** may be formed of a metal material whose resistance is relatively lower than that of the first lower anode electrode **181**. In order to reduce a total resistance of the first anode electrode **180**, a thickness of the first upper anode electrode **182** is larger than a thickness of the first lower anode electrode **181**, preferably.

In the same way as the aforementioned first anode electrode **180**, the first auxiliary electrode **190** may include a first lower auxiliary electrode **191**, and a first upper auxiliary electrode **192**.

The first lower auxiliary electrode **191** is provided between the planarization layer **170** and the first upper auxiliary electrode **192**, wherein the first lower auxiliary electrode **191** enhances an adhesive strength between the planarization layer **170** and the first upper auxiliary electrode **192**. Also, the first lower auxiliary electrode **191** protects a lower surface of the first upper auxiliary electrode **192**, to thereby prevent the lower surface of the first upper auxiliary electrode **192** from being corroded. Thus, an oxidation degree of the first lower auxiliary electrode **191** may be lower than an oxidation degree of the first upper auxiliary electrode **192**. That is, a corrosion resistance in a material of the first lower auxiliary electrode **191** may be superior to a corrosion resistance in a material of the first upper auxiliary electrode **192**. The first lower auxiliary electrode **191** may be formed of the same material as that of the aforementioned first lower anode electrode **181**, for example, alloy (MoTi) of molybdenum and titanium, but is not limited to this material.

The first upper auxiliary electrode **192** is provided on an upper surface of the first lower auxiliary electrode **191**. The first upper auxiliary electrode **192** may be formed of the same material as that of the aforementioned first upper anode electrode **182**, for example, copper (Cu), but is not limited to this material. Preferably, a thickness of the first upper auxiliary electrode **192** with a relatively low resistance is larger than a thickness of the first lower auxiliary electrode **191** with a relatively high resistance, to thereby reduce a total resistance of the first auxiliary electrode **190**.

The first upper auxiliary electrode **192** may be formed of the same material as that of the first upper anode electrode **182**, and the first upper auxiliary electrode **192** may be formed in the same thickness as that of the first upper anode electrode **182**. The first lower auxiliary electrode **191** may be formed of the same material as that of the first lower anode electrode **181**, and the first lower auxiliary electrode **191** may be formed in the same thickness as that of the first lower anode electrode **181**. In this case, the first auxiliary electrode **190** and the first anode electrode **180** may be simultaneously manufactured in the same process.

The second anode electrode **200** is provided on an upper surface of the first anode electrode **180**. The second anode electrode **200** is in contact with entire upper and lateral surfaces of the first anode electrode **180**. That is, an additional insulating layer is not provided between the first anode electrode **180** and the second anode electrode **200**, whereby it is possible to omit a process for forming an insulating layer and a contact hole. The second anode electrode **200** reflects the light emitted from the organic emitting layer **240** to an upper direction, whereby the second anode electrode **200** includes a material with good reflectance. Also, the second anode electrode **200** covers the upper

and lateral surfaces of the first anode electrode **180**, to thereby prevent the upper and lateral surfaces of the first anode electrode **180** from being corroded.

The second anode electrode **200** may include a second lower anode electrode **201**, a second central anode electrode **202**, and a second upper anode electrode **203**.

The second lower anode electrode **201** is provided between the first anode electrode **180** and the second central anode electrode **202**. The second lower anode electrode **201** covers the upper and lateral surfaces of the first anode electrode **180**, to thereby prevent the first anode electrode **180** from being corroded. Thus, an oxidation degree of the second lower anode electrode **201** may be lower than an oxidation degree of each of the first lower anode electrode **181** and the first upper anode electrode **182** included in the first anode electrode **180**. That is, a corrosion resistance in a material of the second lower anode electrode **201** may be superior to a corrosion resistance in a material of each of the first lower anode electrode **181** and the first upper anode electrode **182** included in the first anode electrode **180**. Also, the second lower anode electrode **201** protects a lower surface of the second central anode electrode **202**, to thereby prevent the lower surface of the second central anode electrode **202** from being corroded. Thus, an oxidation degree of the second lower anode electrode **201** may be lower than an oxidation degree of the second central anode electrode **202**. That is, a corrosion resistance in a material of the second lower anode electrode **201** may be superior to a corrosion resistance in a material of the second central anode electrode **202**. The second lower anode electrode **201** may be formed of a transparent conductive material, for example, indium-tin-oxide (ITO), but is not limited to this material.

The second central anode electrode **202** is provided between the second lower anode electrode **201** and the second upper anode electrode **203**. The second central anode electrode **202** is formed of a material with relatively-low resistance and relatively-high reflectance in comparison to the second lower anode electrode **201** and the second upper anode electrode **203**, for example, argentums or silver (Ag), but is not limited to this material. Preferably, a thickness of the second central anode electrode **202** with the relatively low resistance is larger than a thickness of each of the second lower anode electrode **201** and the second upper anode electrode **203** with the relatively high resistance, to thereby reduce a total resistance of the second anode electrode **200**.

The second upper anode electrode **203** is provide on an upper surface of the second central anode electrode **202**, to thereby prevent the upper surface of the second central anode electrode **202** from being corroded. Thus, an oxidation degree of the second upper anode electrode **203** may be lower than an oxidation degree of the second central anode electrode **202**. That is, a corrosion resistance in a material of the second upper anode electrode **203** may be superior to a corrosion resistance in a material of the second central anode electrode **202**. The second upper anode electrode **203** may be formed of a transparent conductive material, for example, indium-tin-oxide (ITO), but is not limited to this material.

The second auxiliary electrode **210** is provided on an upper surface of the first auxiliary electrode **190**. The second auxiliary electrode **210** is formed in the same layer as that of the aforementioned second anode electrode **200**. The second auxiliary electrode **210** is in contact with entire upper and lateral surfaces of the first auxiliary electrode **190**. That is, an additional insulating layer is not provided between the second auxiliary electrode **210** and the first auxiliary electrode **190**, whereby it is possible to omit a process for forming an insulating layer and a contact hole. The second

auxiliary electrode **210** together with the first auxiliary electrode **190** may lower a resistance of the cathode electrode **250**. According to one embodiment of the present invention, the two auxiliary electrodes of the first auxiliary electrode **190** and the second auxiliary electrode **210** are deposited so as to lower the resistance of the cathode electrode **250**, whereby it is possible to control the resistance properties needed for the auxiliary electrode with easiness. In more detail, since the first auxiliary electrode **190** and the first anode electrode **180** are formed in the same layer, it causes a limitation on the size increase of the first auxiliary electrode **190**. According to one embodiment of the present invention, the second auxiliary electrode **210** is deposited on the first auxiliary electrode **190** so that it is possible to effectively lower the resistance of the cathode electrode **250**. Also, the second auxiliary electrode **210** covers the upper and lateral surfaces of the first auxiliary electrode **190**, to thereby prevent the upper and lateral surfaces of the first auxiliary electrode **190** from being corroded.

The second auxiliary electrode **210** may include a second lower auxiliary electrode **211**, a second central auxiliary electrode **212**, and a second upper auxiliary electrode **213**.

The second lower auxiliary electrode **211** is provided between the first auxiliary electrode **190** and the second central auxiliary electrode **212**. The second lower auxiliary electrode **211** covers the upper and lateral surfaces of the first auxiliary electrode **190**, to thereby prevent the first auxiliary electrode **190** from being corroded. Thus, an oxidation degree of the second lower auxiliary electrode **211** may be lower than an oxidation degree of each of the first lower auxiliary electrode **191** and the first upper auxiliary electrode **192** included in the first auxiliary electrode **190**. That is, a corrosion resistance in a material of the second lower auxiliary electrode **211** may be superior to a corrosion resistance in a material of each of the first lower auxiliary electrode **191** and the first upper auxiliary electrode **192**. Also, the second lower auxiliary electrode **211** protects a lower surface of the second central auxiliary electrode **212**, to thereby prevent the lower surface of the second central auxiliary electrode **212** from being corroded. Thus, an oxidation degree of the second lower auxiliary electrode **211** may be lower than an oxidation degree of the second central auxiliary electrode **212**. That is, a corrosion resistance in a material of the second lower auxiliary electrode **211** may be superior to a corrosion resistance in a material of the second central auxiliary electrode **212**. The second lower auxiliary electrode **211** may be formed of a transparent conductive material, for example, indium-tin-oxide (ITO), but is not limited to this material.

The second central auxiliary electrode **212** is provided between the second lower auxiliary electrode **211** and the second upper auxiliary electrode **213**. The second central auxiliary electrode **212** is formed of a material with relatively-low resistance and relatively-high reflectance in comparison to the second lower auxiliary electrode **211** and the second upper auxiliary electrode **213**, for example, argentums or silver (Ag), but is not limited to this material. Preferably, a thickness of the second central auxiliary electrode **212** with the relatively low resistance is larger than a thickness of each of the second lower auxiliary electrode **211** and the second upper auxiliary electrode **213** with the relatively high resistance, to thereby reduce a total resistance of the second auxiliary electrode **210**.

The second upper auxiliary electrode **213** is provide on an upper surface of the second central auxiliary electrode **212**, to thereby prevent the upper surface of the second central auxiliary electrode **212** from being corroded. Thus, an

oxidation degree of the second upper auxiliary electrode **213** may be lower than an oxidation degree of the second central auxiliary electrode **212**. That is, a corrosion resistance in a material of the second upper auxiliary electrode **213** may be superior to a corrosion resistance in a material of the second central auxiliary electrode **212**. The second upper auxiliary electrode **213** may be formed of a transparent conductive material, for example, indium-tin-oxide (ITO), but is not limited to this material.

The second upper auxiliary electrode **213** may be formed of the same material as that of the second upper anode electrode **203**, and the second upper auxiliary electrode **213** may be formed in the same thickness as that of the second upper anode electrode **203**. The second central auxiliary electrode **212** may be formed of the same material as that of the second central anode electrode **202**, and the second central auxiliary electrode **212** may be formed in the same thickness as that of the second central anode electrode **202**. The second lower auxiliary electrode **211** may be formed of the same material as that of the second lower anode electrode **201**, and the second lower auxiliary electrode **211** may be formed in the same thickness as that of the second lower anode electrode **201**. In this case, the second auxiliary electrode **210** and the second anode electrode **200** may be simultaneously manufactured in the same process.

The bank **220** is provided on the second anode electrode **200** and the second auxiliary electrode **210**.

The bank **220**, which exposes the upper surface of the second anode electrode **200**, is provided on one side and the other side of the second anode electrode **200**. According as the bank **220** is provided to expose the upper surface of the second anode electrode **200**, it is possible to secure an image-displaying area. Also, the bank **220** is provided on one side and the other side of the second anode electrode **200** so that it is possible to prevent the lateral surface of the second central anode electrode **202** from being exposed to the external, wherein the lateral surface of the second central anode electrode **202** is relatively vulnerable to corrosion, thereby preventing the lateral surface of the second central anode electrode **202** from being corroded.

The bank **220**, which exposes the upper surface of the second auxiliary electrode **210**, is provided on one side and the other side of the second auxiliary electrode **210**. According as the bank **220** is provided to expose the upper surface of the second auxiliary electrode **210**, it is possible to secure an electrical connection space between the second auxiliary electrode **210** and the cathode electrode **250**. Also, the bank **220** is provided on one side and the other side of the second auxiliary electrode **210** so that it is possible to prevent the lateral surface of the second central auxiliary electrode **212** from being exposed to the external, wherein the lateral surface of the second central auxiliary electrode **212** is relatively vulnerable to corrosion, thereby preventing the lateral surface of the second central auxiliary electrode **212** from being corroded.

Also, the bank **220** is provided between the second anode electrode **200** and the second auxiliary electrode **210**, to thereby insulate the second anode electrode **200** and the second auxiliary electrode **210** from each other. The bank **220** may be formed of an organic insulating material, for example, polyimide resin, acryl resin, benzocyclobutene BCB, and etc., but is not limited to these materials.

The partition **230** is provided on the second auxiliary electrode **210**. The partition **230** is spaced apart from the bank **220**, and the second auxiliary electrode **210** and the cathode electrode **250** are electrically connected with each other through the space between the partition **230** and the

bank **220**. The second auxiliary electrode **210** and the cathode electrode **250** may be electrically connected with each other without forming the partition **230**. However, if forming the partition **230**, it facilitates a deposition process of the organic emitting layer **240**. This will be described in detail as follows.

In case the partition **230** is not formed, it is necessary to provide a mask pattern for covering the upper surface of the second auxiliary electrode **210** when the organic emitting layer **240** is deposited to prevent the upper surface of the second auxiliary electrode **210** from being covered. However, if forming the partition **230**, an upper surface of the partition **230** serves as eaves for the deposition process of the organic emitting layer **240**. Thus, the organic emitting layer **240** is not deposited in an area below the eaves so that there is no need to provide the mask pattern for covering the upper surface of the second auxiliary electrode **210**. From a front view, if the upper surface of the partition **230** serving as the eaves is configured to cover the space between the partition **230** and the bank **220**, it is possible to prevent the organic emitting layer **240** from being permeated into the space between the partition **230** and the bank **220**. Thus, the second auxiliary electrode **210** may be exposed in the space between the partition **230** and the bank **220**. Especially, the organic emitting layer **240** may be manufactured by an evaporation method using a deposition material with superior straightness. Thus, the organic emitting layer **240** is not deposited in the space between the partition **230** and the bank **220** for the deposition process of the organic emitting layer **240**.

As described above, in order to provide the partition **230** whose upper surface serves as the eaves, a width in the upper surface of the partition **230** is larger than a width in the lower surface of the partition **230**. The partition **230** may include a first partition **231** of the lower side and a second partition **232** of the upper side. The first partition **231** is provided on the upper surface of the second auxiliary electrode **210**. The first partition **231** may be formed of the same material as that of the bank **220**, and the first partition **231** and the bank **220** may be manufactured in the same process. The second partition **232** is provided on an upper surface of the first partition **231**. A width in the upper surface of the second partition **232** is larger than a width in the lower surface of the second partition **232**. Especially, the upper surface of the second partition **232** is configured to cover the space between the partition **230** and the bank **220**, whereby the partition **230** serves as the eaves.

The organic emitting layer **240** is provided on the second anode electrode **200**. The organic emitting layer **240** may include a hole injecting layer, a hole transporting layer, an emitting layer, an electron transporting layer and an electron injecting layer. A structure of the organic emitting layer **240** may be changed to various shapes generally known to those in the art.

The organic emitting layer **240** may extend to the upper surface of the bank **220**. However, when the organic emitting layer **240** extends to the upper surface of the bank **220**, the upper surface of the second auxiliary electrode **210** is not covered by the organic emitting layer **240**. If the upper surface of the second auxiliary electrode **210** is covered by the organic emitting layer **240**, it is difficult to electrically connect the second auxiliary electrode **210** and the cathode electrode **250** with each other. As described above, the organic emitting layer **240** may be manufactured for the deposition process without using the mask for covering the upper surface of the second auxiliary electrode **210**. In this

case, the organic emitting layer **240** may be provided on the upper surface of the partition **230**.

The cathode electrode **250** is provided on the organic emitting layer **240**. As the cathode electrode **250** is provided on a surface from which light is emitted, the cathode electrode **250** is formed of a transparent conductive material. Thus, a resistance of the cathode electrode **250** is increased since the cathode electrode **250** is formed of the transparent conductive material. In order to lower the resistance of the cathode electrode **250**, the cathode electrode **250** is connected with the second auxiliary electrode **210**. That is, the cathode electrode **250** is connected with the second auxiliary electrode **210** via the space between the partition **230** and the bank **220**. The cathode electrode **250** may be manufactured by sputtering, that is, a deposition process with inferior straightness. Accordingly, the cathode electrode **250** may be deposited in the space between the partition **230** and the bank **220** for the deposition process of the cathode electrode **250**.

An encapsulation layer for preventing a permeation of moisture may be additionally provided on the cathode electrode **250**. The encapsulation layer may be formed of various materials generally known to those in the art. A color filter for each pixel may be additionally provided on the cathode electrode **250**. In this case, white light may be emitted from the organic emitting layer **240**.

In the pad area (PA) of the substrate **100**, there are a gate insulating film **120**, an insulating interlayer **140**, a signal pad **300**, and a passivation layer **165**.

The gate insulating film **120** is provided on the substrate **100**, and the insulating interlayer **140** is provided on the gate insulating film **120**. The gate insulating film **120** and the insulating interlayer **140**, which extend from the active area (AA), are formed on an entire surface of the pad area (PA).

The signal pad **300** is provided on the insulating interlayer **140**. The signal pad **300** may be formed of the same material as that of the source electrode **150** and the drain electrode **160** of the aforementioned active area (AA). The signal pad **300** is exposed to the external via a fourth contact hole (CH4) provided in the passivation layer **165**, and is connected with the external driver.

The signal pad **300** may include a lower signal pad **301**, a central signal pad **302**, and an upper signal pad **303**.

The lower signal pad **301** is provided between the insulating interlayer **140** and the central signal pad **302**, wherein the lower signal pad **301** enhances an adhesive strength between the insulating interlayer **140** and the central signal pad **302**. Also, the lower signal pad **301** prevents a lower surface of the central signal pad **302** from being corroded. Thus, an oxidation degree of the lower signal pad **301** may be lower than an oxidation degree of the central signal pad **302**. That is, a corrosion resistance in a material of the lower signal pad **301** may be superior to a corrosion resistance in a material of the central signal pad **302**. The lower signal pad **301** may be formed of the same material as that of the aforementioned lower source electrode **151** or lower drain electrode **161**, that is, alloy (MoTi) of molybdenum and titanium, but is not limited to this material.

The central signal pad **302** is provided between the lower signal pad **301** and the upper signal pad **303**. The central signal pad **302** may be formed of a low-resistance metal material such as copper (Cu), but is not limited to this metal material. The central signal pad **302** may be formed of a metal material whose resistance is relatively lower than that of the lower signal pad **301** and the upper signal pad **303**. In order to lower a total resistance of the signal pad **300**, a

thickness of the central signal pad **302** is larger than a thickness of each of the lower signal pad **301** and the upper signal pad **303**, preferably.

The upper signal pad **303** is provided on an upper surface of the central signal pad **302**, to thereby prevent the upper surface of the central signal pad **302** from being corroded. Thus, an oxidation degree of the upper signal pad **303** may be lower than an oxidation degree of the central signal pad **302**. That is, a corrosion resistance in a material of the upper signal pad **303** may be superior to a corrosion resistance in a material of the central signal pad **302**. The upper signal pad **303** may be formed of a transparent conductive material such as indium-tin-oxide (ITO), but is not limited to this material.

According to one embodiment of the present invention, it is possible to prevent the central signal pad, which is vulnerable to corrosion, from being corroded. That is, the lower signal pad **301** prevents the lower surface of the central signal pad **302** from being corroded, the upper signal pad **303** prevents the upper surface of the central signal pad **302** from being corroded, and the passivation layer **165** prevents the lateral surface of the central signal pad **302** from being corroded. According to one embodiment of the present invention, the central signal pad **302**, which is vulnerable to corrosion, is covered by the lower signal pad **301**, the upper signal pad **303** and the passivation layer **165**, so that it is possible to prevent the central signal pad **302** from being corroded.

Meanwhile, the upper signal pad **303** may be formed as the same material as that of the upper source electrode **153** and/or the upper drain electrode **163**, and the upper signal pad **303** may be formed in the same thickness as that of the upper source electrode **153** and/or the upper drain electrode **163**. The central signal pad **302** may be formed as the same material as that of the central source electrode **152** and/or the central drain electrode **162**, and the central signal pad **302** may be formed in the same thickness as that of the central source electrode **152** and/or the central drain electrode **162**. The lower signal pad **301** may be formed as the same material as that of the lower source electrode **151** and/or the lower drain electrode **161**, and the lower signal pad **301** may be formed in the same thickness as that of the lower source electrode **151** and/or the lower drain electrode **161**. In this case, the signal pad **300** and the source electrode **150** and/or the drain electrode **160** may be simultaneously manufactured in the same process.

The passivation layer **165** is provided on the signal pad **300**. The passivation layer **165** extends from the active area (AA). The fourth contact hole (CH4) for exposing a predetermined part of the signal pad **300** is provided in the passivation layer **165**. Especially, the passivation layer **165** covers the lateral surface of the signal pad **300**, and more particularly, the lateral surface of the central signal pad **302** which is vulnerable to corrosion, to thereby prevent the corrosion in the lateral surface of the signal pad **300**.

FIG. 3 is a cross sectional view illustrating an organic light emitting display device according to another embodiment of the present invention. Except for the structures of banks **220b** and **220c**, organic emitting layer **240** and cathode electrode **250**, the organic light emitting display device shown in FIG. 3 is the same as (or substantially the same as) the organic light emitting display device shown in FIG. 2. Thus, the same (or similar) reference numbers will be used throughout the drawings to refer to the same or like parts, and only different structures may be described in detail.

As shown in FIG. 3, the banks **220b** and **220c** are provided on a second anode electrode **200** and a second auxiliary electrode **210**.

The banks **220b** and **220c** include the first bank **220b** and the second banks **220c**. The first bank **220b** covers one side and the other side of the second auxiliary electrode **210**, and the second bank **220c** covers one side and the other side of the second anode electrode **200**. The first bank **220b** and the second bank **220c** are spaced apart from each other, and a planarization layer **170** is exposed to the space between the first bank **220b** and the second bank **220c**.

The second bank **220c**, which exposes a predetermined portion of an upper surface of the second anode electrode **200**, covers one side and the other side of the second anode electrode **200**. According as the second bank **220c** is provided to expose the predetermined portion of the upper surface of the second anode electrode **200**, it is possible to secure an image-displaying area. Also, the second bank **220c** is provided to cover one side and the other side of the second anode electrode **200** so that it is possible to prevent a lateral surface of a second central anode electrode **202** from being exposed to the external, wherein the lateral surface of the second central anode electrode **202** is relatively vulnerable to corrosion, thereby preventing the lateral surface of the second central anode electrode **202** from being corroded.

Also, the second bank **220c** is overlapped with a third contact hole (CH3) provided in the passivation layer **165** and the planarization layer **170**. In this case, the second bank **220c** prevents moisture from being permeated into the inside of the organic emitting layer **240** through the third contact hole (CH3). Meanwhile, in the aforementioned embodiment shown in FIG. 2, the bank **220** may be overlapped with the third contact hole (CH3).

The first bank **220b**, which exposes a predetermined portion of an upper surface of the second auxiliary electrode **210**, covers one side and the other side of the second auxiliary electrode **210**. According as the first bank **220b** is provided to expose the predetermined portion of the upper surface of the second auxiliary electrode **210**, it is possible to secure an electrical connection space between the second auxiliary electrode **210** and the cathode electrode **250**. Also, the first bank **220b** is provided to cover one side and the other side of the second auxiliary electrode **210** so that it is possible to prevent a lateral surface of a second central auxiliary electrode **212** from being exposed to the external, wherein the lateral surface of the second central auxiliary electrode **212** is relatively vulnerable to corrosion, thereby preventing the lateral surface of the second central auxiliary electrode **212** from being corroded.

The first bank **220b** and the second bank **220c** are spaced apart from each other, and the planarization layer **170** is exposed through the space between the first bank **220b** and the second bank **220c**. Thus, the organic emitting layer **240** is provided directly on the upper surface of the planarization layer **170** in the space between the first bank **220b** and the second bank **220c**. Also, the cathode electrode **250** is provided on the upper surface of the organic emitting layer **240** in the space between the first bank **220b** and the second bank **220c**.

FIGS. 4A to 4J are cross sectional views illustrating a method of manufacturing the organic light emitting display device according to one embodiment of the present invention, which shows the method of manufacturing the organic light emitting display device shown in FIG. 2. Thus, the same (or similar) reference numbers will be used throughout the drawings to refer to the same or like parts, and a

repetitive description for the material and structure of each structure may be omitted or brief.

First, as shown in FIG. 4A, the active layer **110**, the gate insulating film **120**, the gate electrode **130**, the insulating interlayer **140**, the source electrode **150**, the drain electrode **160** and the signal pad **300** are sequentially provided on the substrate **100**.

In more detail, the active layer **110** is provided on the substrate **100**, the gate insulating film **120** is provided on the active layer **110**, the gate electrode **130** is provided on the gate insulating film **120**, the insulating interlayer **140** is provided on the gate electrode **130**, the first and second contact holes (CH1, CH2) are provided in the gate insulating film **120** and the insulating interlayer **140**, the drain electrode **160** connected with one end of the active layer **110** via the first contact hole (CH1) is provided and the source electrode **150** connected with the other end of the active layer **110** via the second contact hole (CH2) is provided, and the signal pad **300** is provided.

In this case, the active layer **110**, the gate electrode **130**, the source electrode **150** and the drain electrode **160** are provided in the active area (AA), the gate insulating film **120** and the insulating interlayer **140** extend from the active area (AA) to the pad area (PA), and the signal pad **300** is provided in the pad area (PA). By the aforementioned manufacturing process, the thin film transistor layer (T) is formed in the active area (AA), and the signal pad **300** is formed in the pad area (PA).

The source electrode **150** may include the lower source electrode **151**, the central source electrode **152**, and the upper source electrode **153**. The drain electrode **160** may include the lower drain electrode **161**, the central drain electrode **162** and the upper drain electrode **163**. The signal pad **300** may include the lower signal pad **301**, the central signal pad **302** and the upper signal pad **303**. The source electrode **150**, the drain electrode **160** and the signal pad **300** may be formed of the same material, and may be simultaneously manufactured in the same patterning process.

Then, as shown in FIG. 4B, the passivation layer **165** is provided on the source electrode **150**, the drain electrode **160** and the signal pad **300**. The planarization layer **170** is provided on the passivation layer **165**. The third contact hole (CH3) is formed in the passivation layer **165** and the planarization layer **170**, whereby the source electrode **150** is exposed via the third contact hole (CH3).

The passivation layer **165** extends from the active area (AA) to the pad area (PA), and the planarization layer **170** is provided in the active area (AA). The thin film transistor is not formed in the pad area (PA), that is, it is unnecessary to planarize the surface of the pad area (PA). Accordingly, the planarization layer **170** is not provided in the pad area (PA).

The passivation layer **165**, the planarization layer **170** and the third contact hole (CH3) may be manufactured by one mask process using a half-tone mask.

According to one embodiment of the present invention, the signal pad **300** is not exposed to the external for the process of forming the third contact hole (CH3) to expose the source electrode **150** to the external. In order to connect the signal pad **300** with the external driver, it is necessary to remove the area of the passivation layer **165** which covers the upper surface of the signal pad **300**. Herein, the process of removing the area of the passivation layer **165** which covers the upper surface of the signal pad **300** and the process of forming the third contact hole (CH3) may be carried out at the same time. However, if the process of removing the area of the passivation layer **165** which covers

17

the upper surface of the signal pad **300** and the process of forming the third contact hole (CH3) are carried out at the same time, the signal pad **300** may be damaged by an etchant used for patterning the first anode electrode **180** and the first auxiliary electrode **190** to be explained with reference to FIG. 4C. Thus, in order to prevent the signal pad **300** from being damaged by the etchant, the signal pad **300** is not exposed to the external for the process of forming the third contact hole (CH3).

Then, as shown in FIG. 4C, the first anode electrode **180** and the first auxiliary electrode **190** are provided on the planarization layer **170** of the active area (AA), wherein the first anode electrode **180** and the first auxiliary electrode **190** are spaced apart from each other.

The first anode electrode **180** is connected with the source electrode **150** via the third contact hole (CH3). The third contact hole (CH3) may be provided to expose the drain electrode **160**. In this case, the drain electrode **160** and the first anode electrode **180** may be connected with each other via the third contact hole (CH3).

The first anode electrode **180** may include the first lower anode electrode **181** and the first upper anode electrode **182**, and the first auxiliary electrode **190** may include the first lower auxiliary electrode **191** and the first upper auxiliary electrode **192**.

The first anode electrode **180** and the first auxiliary electrode **190** may be formed of the same material, and may be simultaneously manufactured in the same patterning process.

Then, as shown in FIG. 4D, the second anode electrode **200** is provided on the first anode electrode **180** of the active area (AA), and the second auxiliary electrode **210** is provided on the first auxiliary electrode **190** of the active area (AA).

The second anode electrode **200** is patterned to cover the upper and lateral surfaces of the first anode electrode **180**, and the second auxiliary electrode **210** is patterned to cover the upper and lateral surfaces of the first auxiliary electrode **190**. The second anode electrode **200** and the second auxiliary electrode **210** may be formed of the same material, and may be simultaneously manufactured in the same patterning process.

The second anode electrode **200** may include the second lower anode electrode **201**, the second central anode electrode **202**, and the second upper anode electrode **203**, and the second auxiliary electrode **210** may include the second lower auxiliary electrode **211**, the second central auxiliary electrode **212**, and the second upper auxiliary electrode **213**.

Then, as shown in FIG. 4E, a photoresist pattern **220a** is formed in the active area (AA) and the pad area (PA).

The photoresist pattern **220a** is provided on the second anode electrode **200**, the second auxiliary electrode **210**, the planarization layer **170** and the passivation layer **165**.

The photoresist pattern **220a** includes an area having a first thickness (t1) of a relatively large thickness, and an area having a second thickness (t2) of a relatively small thickness. The area having the first thickness (t1) corresponds to a lateral side area of the second anode electrode **200**, and also corresponds to a lateral side area of the second auxiliary electrode **210**, and a predetermined portion of a central area of the second auxiliary electrode **210**. The area having the second thickness (t2) corresponds to an area between each area having the first thickness (t1). In detail, the area having the second thickness (t2) corresponds to a central area of the second anode electrode **200**, also corresponds to an area between each area having the first thickness (t1) in the central area of the second auxiliary electrode **210**. Also, the

18

area having the second thickness (t2) corresponds to the pad area. At least one portion of the photoresist pattern **220a** is not provided in an area overlapped with the signal pad **300**.

The photoresist pattern **220a** includes the area having the first thickness (t1) and the area having the second thickness (t2), and the photoresist pattern **220a** is not provided in the area overlapped with the signal pad **300**. The photoresist pattern **220a** may be obtained by a half-tone mask process.

Then, as shown in FIG. 4F, the fourth contact hole (CH4) is formed by removing the area of the passivation layer **165** for covering the upper surface of the signal pad **300** under the condition that the photoresist pattern **220a** is used as a mask. That is, the fourth contact hole (CH4) is provided in the passivation layer **165**, whereby the signal pad **300** is exposed to the external through the fourth contact hole (CH4). The signal pad **300** may be connected with the external driver via the fourth contact hole (CH4).

Then, as shown in FIG. 4G, the bank **220** and the first partition **231** are formed by ashing the photoresist pattern **220a**.

By ashing the photoresist pattern **220a**, the area having the second thickness (t2) of the relatively small thickness is removed, and the area having the first thickness (t1) of the relatively large thickness remains, whereby the bank **220** and the first partition **231** are formed by the remaining photoresist pattern **220a**.

In more detail, the photoresist pattern **220a** is removed from the area having the second thickness (t2) of the relatively small thickness, to thereby expose the upper surface of the second anode electrode **200**, the predetermined portion of the upper surface of the second auxiliary electrode **210**, and the upper surface of the passivation layer **165**. Also, the photoresist pattern **220a** remains in the area having the first thickness (t1) of the relatively large thickness, whereby the bank **220** is formed on one side and the other side of the second anode electrode **200**, the bank **220** is formed on one side and the other side of the second auxiliary electrode **210**, and the first partition **231** is formed on the upper surface of the second auxiliary electrode **210**. The first partition **231** is provided at a predetermined distance from the bank **220**.

According to one embodiment of the present invention, the fourth contact hole (CH4) for exposing the signal pad **300** to the external is formed with the photoresist pattern **220a** used as the mask, and the bank **220** and the first partition **231** are formed with the photoresist pattern **220a** remaining after the ashing treatment. According to one embodiment of the present invention, the fourth contact hole (CH4), the bank **220** and the first partition **231** may be formed by one mask process so that it is possible to reduce the mask process.

As shown in FIG. 4H, the second partition **232** is provided on the first partition **231**, to thereby form the partition **230** including the first partition **231** and the second partition **232**.

The partition **230** is provided at the predetermined distance from the bank **220**, whereby the space is prepared between the partition **230** and the bank **220**.

In order to provide the partition **230** whose upper surface serves as the eaves, the width in the upper surface of the second partition **232** is larger than the width in the lower surface of the second partition **232**. Especially, from a front view, the space between the partition **230** and the bank **220** is covered by the upper surface of the second partition **232** so that it is possible to prevent the organic emitting layer **240** from being deposited in the space between the partition **230** and the bank **220** for the deposition process of the organic emitting layer **240**.

As shown in FIG. 4I, the organic emitting layer **240** is provided on the second anode electrode **200**. The organic emitting layer **240** may be manufactured by an evaporation method using a deposition material with superior straightness. Thus, the organic emitting layer **240** is deposited on the upper surface of the bank **220** and the partition **230**, however, the organic emitting layer **240** is not deposited in the space between the bank **220** and the partition **230**. That is, the upper surface of the partition **230** serves as the eaves for the deposition process of the organic emitting layer **240**, whereby it is possible to prevent the organic emitting layer **240** from being deposited in the space between the partition **230** and the bank **220** for the deposition process of the organic emitting layer **240** without using the mask pattern of covering the upper surface of the second auxiliary electrode **210**.

Then, as shown in FIG. 4J, the cathode electrode **250** is provided on the organic emitting layer **240**.

The cathode electrode **250** is connected with the second auxiliary electrode **210** via the space between the partition **230** and the bank **220**. The cathode electrode **250** may be manufactured by sputtering, that is, a deposition process with inferior straightness. Accordingly, the cathode electrode **250** may be deposited in the space between the partition **230** and the bank **220** for the deposition process of the cathode electrode **250**.

FIGS. 5A to 5K are cross sectional views illustrating a method of manufacturing the organic light emitting display device according to another embodiment of the present invention, which shows the method of manufacturing the organic light emitting display device shown in FIG. 3.

First, as shown in FIG. 5A, the active layer **110**, the gate insulating film **120**, the gate electrode **130**, the insulating interlayer **140**, the source electrode **150**, the drain electrode **160** and the signal pad **300** are sequentially provided on the substrate **100**.

This process is the same as the aforementioned process of FIG. 4A, whereby a detailed description for this process will be omitted.

Then, as shown in FIG. 5B, the passivation layer **165** is provided on the source electrode **150**, the drain electrode **160** and the signal pad **300**. The planarization layer **170** is provided on the passivation layer **165**. The third contact hole (CH3) is formed in the passivation layer **165** and the planarization layer **170**, whereby the source electrode **150** is exposed via the third contact hole (CH3). If needed, the drain electrode **160** may be exposed via the third contact hole (CH3).

This process is the same as the aforementioned process of FIG. 4B, whereby a detailed description for this process will be omitted.

Then, as shown in FIG. 5C, the first anode electrode **180** and the first auxiliary electrode **190** are provided on the planarization layer **170** of the active area (AA), wherein the first anode electrode **180** is spaced apart from the first auxiliary electrode **190**.

This process is the same as the aforementioned process of FIG. 4C, whereby a detailed description for this process will be omitted.

Then, as shown in FIG. 5D, a second electrode layer **200a** is provided on an entire surface of the substrate **100**. The second electrode layer **200a** is provided on the upper surface of the passivation layer **165** of the pad area (PA), and also provided on the upper surfaces of the planarization layer **170**, the first anode electrode **180** and the first auxiliary electrode **190** of the active area (AA).

The second electrode layer **200a** may include a second lower electrode layer **201a**, a second central electrode layer **202a**, and a second upper electrode layer **203a**. Through a patterning process, the second anode electrode **200** and the second auxiliary electrode **210** are formed by the second electrode layer **200a**.

That is, the second lower anode electrode **201** and the second lower auxiliary electrode **211** are formed by the second lower electrode layer **201a**, the second central anode electrode **202** and the second central auxiliary electrode **212** are formed by the second central electrode layer **202a**, and the second upper anode electrode **203** and the second upper auxiliary electrode **213** are formed by the second upper electrode layer **203a**.

Then, as shown in FIG. 5E, a photoresist pattern **220a** is provided on the second electrode layer **200a** of the active area (AA) and the pad area (PA).

The photoresist pattern **220a** includes an area having a first thickness (H1) of a relatively large thickness, and an area having a second thickness (H2) of a relatively small thickness.

The area having the first thickness (H1) corresponds to a lateral side area of the first anode electrode **180**, and also corresponds to a lateral side area of the first auxiliary electrode **190**, and a predetermined portion of a central area of the first auxiliary electrode **190**. The area having the second thickness (H2) corresponds to an area between each area having the first thickness (H1). In detail, the area having the second thickness (H2) corresponds to a central area of the first anode electrode **190**, also corresponds to an area between each area having the first thickness (H1) in the central area of the first auxiliary electrode **190**. Also, the area having the second thickness (H2) corresponds to the pad area.

Also, the photoresist pattern **220a** is not provided in at least one portion of an area overlapped with the signal pad **300**, and the photoresist pattern **220a** is not provided in the boundary area between the active area (AA) and the pad area (PA). Also, the photoresist pattern **220a** is not provided in the area between the first anode electrode **180** and the first auxiliary electrode **190**.

The photoresist pattern **220a** including the area having the first thickness (H1) and the area having the second thickness (H2) may be obtained by a half-tone mask process.

Then, as shown in FIG. 5F, the area of the second electrode layer **200a** and the area of the passivation layer **165** are removed by using the photoresist pattern **220a** as a mask.

In detail, the fourth contact hole (CH4) is formed by removing the area of the second electrode layer **200a** and the area of the passivation layer **165** provided on the signal pad **300** under the condition the photoresist pattern **220a** is used as the mask. That is, according as the fourth contact hole (CH4) is formed in the passivation layer **165**, the signal pad **300** is exposed to the external via the fourth contact hole (CH4). The signal pad **300** may be connected with an external driver via the fourth contact hole (CH4).

Also, the second anode electrode **200** and the second auxiliary electrode **210** are formed by removing the area of the second electrode layer **200a** in the boundary area between the active area (AA) and the pad area (PA) and removing the area of the second electrode layer **200a** between the first anode electrode **180** and the first auxiliary electrode **190**. That is, the second anode electrode **200** and the second auxiliary electrode **210** are formed by exposing the planarization layer **170** in the boundary area between the

21

active area (AA) and the pad area (PA), and the planarization layer 170 between the first anode electrode 180 and the first auxiliary electrode 190.

After that, the ashing treatment is applied to the photoresist pattern 220a, whereby the photoresist pattern 220a is removed from the area having the second thickness (H2) of the relatively small thickness, and the photoresist pattern 220 remains in the area having the first thickness (H1) of the relatively large thickness. Thus, the first bank 220b, the second bank 220c and the first partition 231 are formed by the remaining photoresist pattern 220a.

According to another embodiment of the present invention, the second anode electrode 200 and the second auxiliary electrode 210 are patterned by using the photoresist pattern 220a as the mask, the fourth contact hole (CH4) for exposing the signal pad 300 to the external is formed by using the photoresist pattern 220a as the mask, and the first bank 220b, the second bank 220c and the first partition 231 are formed by the photoresist pattern 220a remaining after the ashing treatment. According to another embodiment of the present invention, the second anode electrode 200, the second auxiliary electrode 210, the fourth contact hole (CH4), the first bank 220b, the second bank 220c and the first partition 231 are manufactured by one mask process, to thereby reduce the mask process.

Then, as shown in FIG. 5G, a lower end of the bank 220b and 220c is connected with the planarization layer 170 by a thermal reflow process.

Referring to the aforementioned process of FIG. 5F, after the area of the second electrode layer 200a is etched, the bank 220b and 220c is formed by applying the ashing treatment to the photoresist pattern 220a. In this case, a lower end of the bank 220b and 220c is partially missing so that the bank 220b and 220c is not in contact with the planarization layer 170. Thus, the lateral sides of the second anode electrode 200 and the second auxiliary electrode 210 are exposed to the external. According as the lower end of the bank 220b and 220c is connected with the planarization layer 170 for the process of FIG. 5G, it is possible to cover the lateral sides of the second anode electrode 200 and the second auxiliary electrode 210.

The thermal reflow process indicates a process of deforming a structure by a high temperature. According as the lateral side of the bank 220b and 220c is melt by the high temperature, a link of polymer for the bank 220b and 220c is partially broken, whereby the melted lateral side of the bank 220b and 220c is shrunk and then connected with the planarization layer 170.

Then, as shown in FIG. 5H, the remaining second electrode layer 200a is removed from the pad area (PA). The process of removing the remaining second electrode layer 200a from the pad area (PA) may be carried out by a laser irradiation process.

Then, as shown in FIG. 5I, the second partition 232 is provided on the first partition 231, to thereby form the partition 230 including the first partition 231 and the second partition 232.

This process is the same as the aforementioned process of FIG. 4H, whereby a detailed description for this process will be omitted.

As shown in FIG. 5J, the organic emitting layer 240 is provided on the second anode electrode 200. The organic emitting layer 240 may be manufactured by an evaporation method using a deposition material with superior straightness. Thus, the organic emitting layer 240 is deposited on the upper surface of the bank 220b and 220c, the upper surface of the planarization layer 170 between the first bank 220b

22

and the second bank 220c, the upper surface of the partition 230, however, the organic emitting layer 240 is not deposited in the space between the first bank 220b and the partition 230.

As shown in FIG. 5K, the cathode electrode 250 is provided on the organic emitting layer 240.

The cathode electrode 250 is connected with the second auxiliary electrode 210 through the space between the first bank 220b and the partition 230. The cathode electrode 250 may be manufactured by sputtering, that is, a deposition process with inferior straightness. Accordingly, the cathode electrode 250 may be deposited in the space between the partition 230 and the first bank 220b for the deposition process of the cathode electrode 250.

According to one embodiment of the present invention, instead of forming the pad electrode, the signal pad is provided under the passivation layer so that it is possible to prevent the lateral surface of the signal pad from being exposed, and furthermore, to prevent the lateral surface of the signal pad from being corroded.

According to one embodiment of the present invention, the signal pad includes the lower signal pad, the central signal pad, and the upper signal pad. Also, the central signal pad which is vulnerable to corrosion is surrounded by the lower signal pad, the upper signal pad, and the passivation layer, to thereby prevent the signal pad from being corroded.

According to one embodiment of the present invention, the two auxiliary electrodes of the first auxiliary electrode and the second auxiliary electrode are deposited in sequence so as to lower the resistance of the cathode electrode, whereby it is possible to control the resistance properties needed for the auxiliary electrode with easiness.

According to one embodiment of the present invention, the first partition, the bank, and the contact hole for exposing the signal pad are manufactured together by one mask process, to thereby reduce the mask process.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the inventions. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. An organic light emitting display device comprising: a substrate having an active area and a pad area; an anode electrode on the active area of the substrate; an organic emitting layer on the anode electrode; a cathode electrode on the organic emitting layer; an auxiliary electrode connected with the cathode electrode and provided in the same layer as the anode electrode; a signal pad on the pad area of the substrate; and a passivation layer having a contact hole for exposing an upper surface of the signal pad, the passivation layer for covering a lateral surface of the signal pad, wherein the signal pad includes a lower signal pad, a central signal pad and an upper signal pad, and the central signal pad is surrounded by the lower signal pad, the upper signal pad and the passivation layer, wherein the auxiliary electrode includes a first auxiliary electrode, and a second auxiliary electrode for covering upper and lateral surfaces of the first auxiliary electrode, and wherein the first auxiliary electrode includes a first lower auxiliary electrode and a first upper auxiliary electrode, and the second auxiliary electrode includes a second

23

lower auxiliary electrode, a second central auxiliary electrode and a second upper auxiliary electrode.

2. The organic light emitting display device according to claim 1, wherein the anode electrode includes a first anode electrode, and a second anode electrode for covering upper and lateral surfaces of the first anode electrode.

3. The organic light emitting display device according to claim 2,

wherein the first anode electrode is forming of the same material as the first auxiliary electrode and provided in the same layer as the first auxiliary electrode, and the second anode electrode is formed of the same material as the second auxiliary electrode and provided in the same layer as the second auxiliary electrode.

4. The organic light emitting display device according to claim 1, further comprising:

a first bank provided on one side and the other side of the auxiliary electrode; and

a partition provided on the auxiliary electrode and spaced apart from the first bank,

wherein the cathode electrode is connected with the auxiliary electrode via the space between the first bank and the partition.

5. The organic light emitting display device according to claim 4, further comprising:

a second bank provided on one side and the other side of the anode electrode, wherein the first bank and the second bank are spaced apart from each other,

wherein the anode electrode and the auxiliary electrode are provided on a planarization layer.

6. The organic light emitting display device according to claim 5, wherein the planarization layer is exposed via the space between the first bank and the second bank, and the organic emitting layer is provided on an upper surface of the exposed planarization layer.

7. The organic light emitting display device according to claim 5, wherein the planarization layer having a contact hole is additionally provided under the second bank, and the second bank is overlapped with the contact hole.

8. An organic light emitting display device comprising:
a substrate having an active area and a pad area;
an anode electrode on the active area of the substrate;
an organic emitting layer on the anode electrode;
a cathode electrode on the organic emitting layer; and
an auxiliary electrode connected with the cathode electrode and provided in the same layer as the anode electrode,

wherein the auxiliary electrode includes a first auxiliary electrode, and a second auxiliary electrode on the first auxiliary electrode, and the second auxiliary electrode extends from an upper surface of the first auxiliary electrode to a lateral surface of the first auxiliary electrode.

9. The organic light emitting display device according to claim 8, wherein the second auxiliary electrode is provided to entirely cover the upper and lateral surfaces of the first auxiliary electrode.

10. The organic light emitting display device according to claim 8, wherein the second auxiliary electrode includes a second lower auxiliary electrode, a second central auxiliary

24

electrode and a second upper auxiliary electrode, and the second lower auxiliary electrode contacts the upper and lateral surfaces of the first auxiliary electrode.

11. The organic light emitting display device according to claim 10, wherein the second central auxiliary electrode is provided to cover the upper and lateral surfaces of the first auxiliary electrode.

12. The organic light emitting display device according to claim 10, wherein the first auxiliary electrode includes a first lower auxiliary electrode and a first upper auxiliary electrode, and the second lower auxiliary electrode contacts a lateral surface of the first lower auxiliary electrode and a lateral surface of the first upper auxiliary electrode.

13. The organic light emitting display device according to claim 8, wherein the anode electrode includes a first anode electrode, and a second anode electrode on the first anode electrode, and the second anode electrode extends from an upper surface of the first anode electrode to a lateral surface of the first anode electrode.

14. The organic light emitting display device according to claim 13, wherein a material of the first anode electrode is same as a material of the first auxiliary electrode, and a material of the second anode electrode is same as a material of the second auxiliary electrode.

15. An organic light emitting display device comprising:

a substrate having an active area and a pad area;

a thin film transistor including a source electrode on the active area of the substrate;

an anode electrode on the thin film transistor;

an organic emitting layer on the anode electrode;

a cathode electrode on the organic emitting layer;

an auxiliary electrode connected with the cathode electrode and provided in the same layer as the anode electrode;

a signal pad on the pad area of the substrate; and

a passivation layer having a contact hole for exposing an upper surface of the signal pad, the passivation layer for covering a lateral surface of the signal pad,

wherein the signal pad includes a lower signal pad, a central signal pad on the lower signal pad, and an upper signal pad on the central signal pad, and the source electrode includes a lower source electrode, a central source electrode on the lower source electrode, and an upper source electrode on the central source electrode.

16. The organic light emitting display device according to claim 15, wherein a material of the lower signal pad is same as a material of the lower source electrode, a material of the central signal pad is same as a material of the central source electrode, and a material of the upper signal pad is same as a material of the upper source electrode.

17. The organic light emitting display device according to claim 15, wherein the thin film transistor further includes a gate electrode and an insulating interlayer between the gate electrode and the source electrode, and

wherein the signal pad contacts an upper surface of the insulating interlayer.

* * * * *

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摘要(译)

讨论的是一种有机发光显示装置，其可以包括基板上的有源区和焊盘区，其中，有源区包括阳极，有机发光层，阴极和与阴极连接的辅助电极。提供在与阳极电极相同的层中，并且焊盘区域包括信号焊盘，以及用于覆盖信号焊盘的侧表面的钝化层，其中钝化层具有用于暴露信号焊盘的上表面的接触孔。而且，信号焊盘包括下信号焊盘，中央信号焊盘和上信号焊盘，中央信号焊盘被下信号焊盘，上信号焊盘和钝化层包围。

