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(54) **ORGANIC LIGHT-EMITTING DISPLAY**

(58) **Field of Classification Search**

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(Continued)

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(30) **Foreign Application Priority Data**

(57) **ABSTRACT**

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An organic light-emitting display is disclosed. In one embodiment, the display includes i) a substrate, ii) a thin film transistor formed on the substrate, and comprising i) a gate electrode, ii) an active layer electrically insulated from the gate electrode, and iii) source and drain electrodes that are electrically connected to the active layer and iii) a first electrode electrically connected to the thin film transistor. The display further includes an intermediate layer formed on the first electrode and comprising an organic emission layer and a second electrode formed on the intermediate layer, wherein the source electrode or the drain electrode has an

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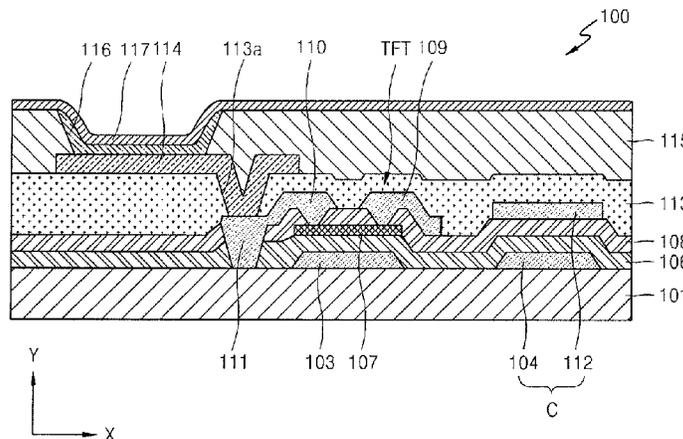
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US RE46,922 E

Page 2

optical blocking portion extending in the direction of substrate thickness.

42 Claims, 2 Drawing Sheets

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See application file for complete search history.

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FIG. 1

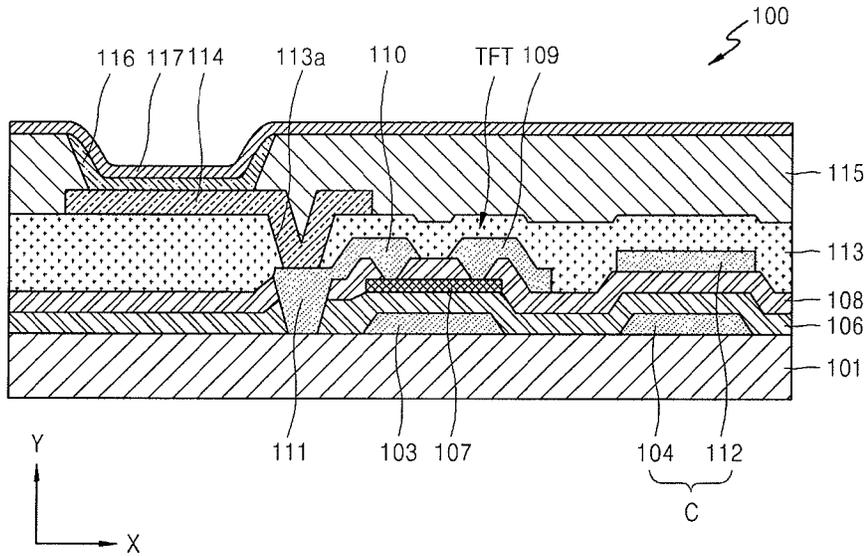


FIG. 2

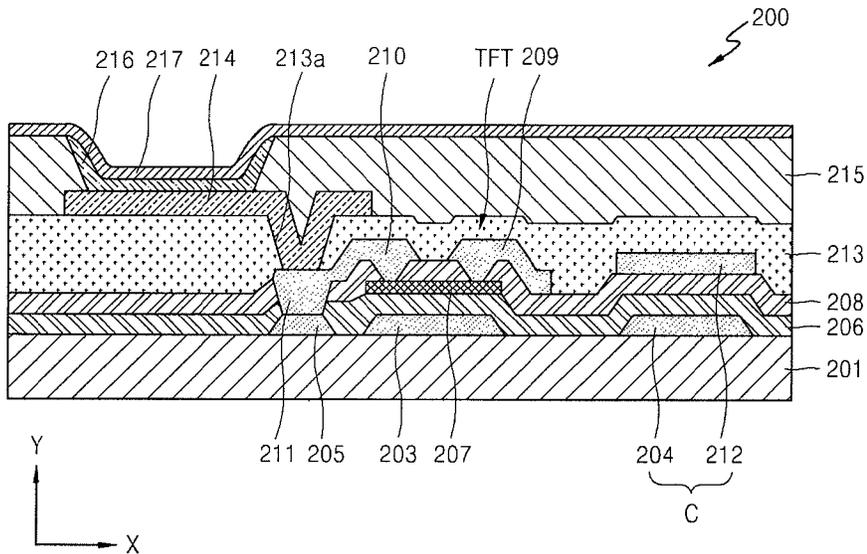
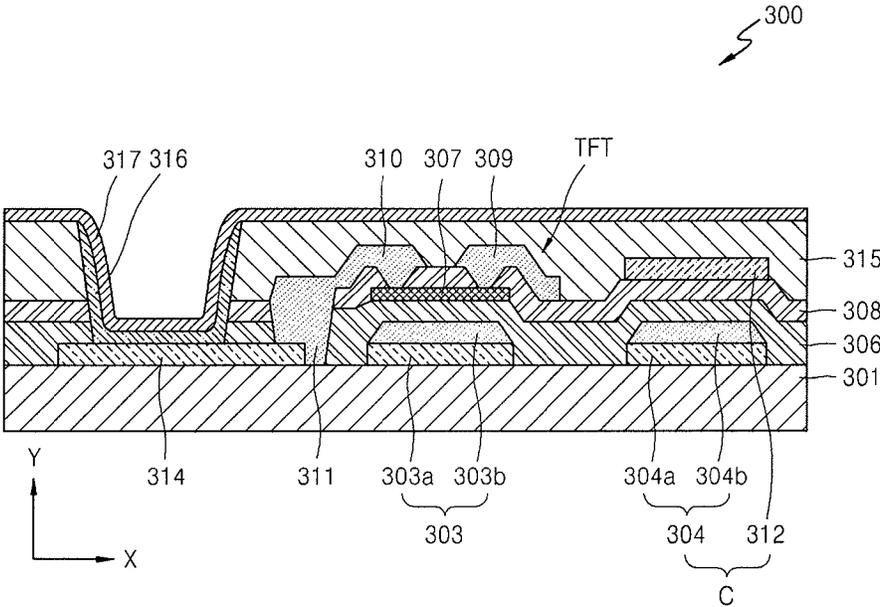


FIG. 3



ORGANIC LIGHT-EMITTING DISPLAY

Matter enclosed in heavy brackets [] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.

CROSS-REFERENCE TO RELATED PATENT APPLICATION

This application is a broadening reissue of U.S. patent application Ser. No. 13/069,740, filed Mar. 23, 2011, now U.S. Pat. No. 8,502,230, issued Aug. 6, 2013, which claims the benefit of Korean Patent Application No. 10-2010-0053025, filed on Jun. 4, 2010, in the Korean Intellectual Property Office[,] the [disclosure] disclosures of which [is] are incorporated herein in [its entirety] their entirety by reference.

BACKGROUND

1. Field

The described technology generally relates to an organic light-emitting display.

2. Description of the Related Technology

Today, cathode ray tube (CRT) displays have been largely replaced by flat displays having a thin profile. From among various types of flat display technologies, an organic light-emitting diode (OLED) display is self emissive, and has desirable characteristics such as a large viewing angle, good contrast characteristics, fast response speeds, enhanced brightness and low power consumption. Thus, such a display has drawn widespread attention as the next-generation commercial display.

An organic light-emitting display includes a cathode electrode and an anode electrode with an organic emission layer therebetween. If a voltage is applied to the cathode electrode and the anode electrode, visible light is generated from the organic emission layer.

An active matrix (AM) organic light-emitting display includes driving and switching thin film transistors (TFTs) to provide electrical signals to each OLED. TFTs generally degrade when exposed to light. Generally, the performance of an organic light-emitting display depends on the optical reliability of its TFTs.

The performance of the active semiconductor layer included in the thin film transistor degrades with exposure to visible light generated from the organic emission layer. Accordingly, the electrical characteristics of the thin film transistor are changed, thereby diminishing the image quality of the OLED display.

SUMMARY

One inventive aspect is an organic light-emitting display in which image quality can be easily improved.

Another aspect is an organic light-emitting display including a substrate; a thin film transistor that is disposed on the substrate and includes a gate electrode, an active layer insulated from the gate electrode, and a source electrode and drain electrode that are electrically connected to the active layer; a first electrode that is electrically connected to the thin film transistor; an intermediate layer formed on the first electrode and including an organic emission layer; and a

second electrode formed on the intermediate layer, wherein the source electrode or the drain electrode includes an optical blocking unit extending in a thickness direction of the substrate.

The source electrode or the drain electrode may be connected to the first electrode, and the source electrode or drain electrode that is connected to the first electrode may include the optical blocking unit.

The active layer may include an oxide semiconductor material.

The gate electrode may be formed on the substrate, the active layer may be formed over the gate electrode, and the optical blocking unit may include a region that overlaps the gate electrode in a direction perpendicular to the thickness direction of the substrate.

The optical blocking unit may contact the substrate.

The organic light-emitting display may further include a buffer layer between the substrate and the thin film transistor, and the optical blocking unit may contact the buffer layer.

A passivation layer that includes a via-hole may be disposed between the thin film transistor and the first electrode, a via-hole. The source electrode or the drain electrode may be connected to the first electrode via the via-hole. The optical blocking unit may include a region that overlaps the via-hole in the thickness direction of the substrate.

The gate electrode may be formed on the substrate. The active layer may be formed on the gate electrode. The organic light-emitting display may further include a conductive unit formed on the substrate to be disposed apart from the gate electrode. The optical blocking unit and the conductive unit may be connected to each other.

The conductive unit may include the same material as the gate electrode.

The organic light-emitting display may further include a passivation layer disposed between the thin film transistor and the first electrode, the passivation layer including a via-hole. The source electrode or the drain electrode may be connected to the first electrode via the via-hole. The optical blocking unit may include a region that overlaps the via-hole in the thickness direction of the substrate.

The gate electrode and the first electrode may be formed on the substrate to be disposed apart from each other. The active layer may be formed on the gate electrode. The optical blocking unit may include a region that overlaps the gate electrode in a direction perpendicular to the thickness direction of the substrate.

The optical blocking unit may contact a side surface of the first electrode.

The optical blocking unit may contact a side surface of the first electrode facing the gate electrode.

The optical blocking unit may cover a region of a side surface of the first electrode, which contacts the substrate.

The organic light-emitting display may further include a buffer layer disposed between the substrate and the first electrode. The optical blocking unit may cover a region of a side surface of the first electrode that contacts the buffer layer.

Another aspect is an organic light-emitting display comprising: a substrate; a thin film transistor formed on the substrate, and comprising i) a gate electrode, ii) an active layer electrically insulated from the gate electrode, and iii) source and drain electrodes that are electrically connected to the active layer; a first electrode electrically connected to the thin film transistor; an intermediate layer formed on the first electrode and comprising an organic emission layer; and a second electrode formed on the intermediate layer, wherein

the source electrode or the drain electrode has an optical blocking portion extending in the direction of substrate thickness.

In the above display, the source electrode or the drain electrode is electrically connected to the first electrode, and wherein the electrode that is connected to the first electrode comprises the optical blocking portion. In the above display, the active layer is formed at least partially of an oxide semiconductor material. In the above display, the gate electrode is formed on the substrate, wherein the active layer is formed over the gate electrode, and wherein the optical blocking portion includes a region that overlaps with at least part of the gate electrode in a direction substantially perpendicular to the substrate thickness.

In the above display, the optical blocking portion contacts the substrate. The above display further comprises a buffer layer formed between the substrate and the thin film transistor, wherein the optical blocking portion contacts the buffer layer. The above display further comprises a passivation layer disposed between the thin film transistor and the first electrode, the passivation layer including a via-hole, wherein the source electrode or the drain electrode is connected to the first electrode by way of the via-hole, and wherein the optical blocking portion includes a region that overlaps with at least part of the via-hole in the thickness direction of the substrate.

In the above display, the gate electrode is formed on the substrate, wherein the active layer is formed on the gate electrode, wherein the organic light-emitting display further comprising a conductive unit formed on the substrate to be disposed apart from the gate electrode, and wherein the optical blocking portion and the conductive unit are connected to each other. In the above display, the conductive unit and the gate electrode are formed of the same material.

The above display further comprises a passivation layer disposed between the thin film transistor and the first electrode, the passivation layer including a via-hole, wherein the source electrode or the drain electrode is electrically connected to the first electrode via the via-hole, and wherein the optical blocking portion includes a region that overlaps with at least part of the via-hole in the thickness direction of the substrate.

In the above display, the gate electrode and the first electrode are formed on the substrate to be disposed apart from each other, wherein the active layer is formed on the gate electrode, and wherein the optical blocking portion includes a region that overlaps with at least part of the gate electrode in a direction substantially perpendicular to the thickness direction of the substrate. In the above display, the optical blocking portion contacts a side surface of the first electrode. In the above display, the optical blocking portion contacts a side surface of the first electrode facing the gate electrode.

In the above display, the optical blocking portion at least partially covers a side surface of the first electrode, which contacts the substrate. The above display further comprises a buffer layer disposed between the substrate and the first electrode, wherein the optical blocking portion at least partially covers a side surface of the first electrode that contacts the buffer layer.

Another aspect is an organic light-emitting display comprising: a thin film transistor (TFT) formed on a substrate, wherein the TFT comprises i) a gate electrode, ii) an active layer electrically insulated from the gate electrode, and iii) source and drain electrodes electrically connected to the active layer; a first electrode electrically connected to the TFT; an organic light emission layer formed on the first

electrode and configured to emit light; and a second electrode formed on the organic light emission layer, wherein a portion of at least one of the source electrode and the drain electrode extends in the direction of substrate thickness and is configured to substantially block the emitted light from entering the active layer of the TFT.

In the above display, only one of the source and drain electrodes includes the portion, and wherein the electrode having the portion is formed to be closer to the organic light emitting layer than the other electrode. The above display further comprises a gate insulating layer formed between the gate electrode and active layer, wherein the portion at least partially penetrates the gate insulating layer. In the above display, the portion substantially completely penetrates the gate insulating layer. In the above display, the portion contacts the substrate or a conductive unit formed between the portion and substrate.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic cross-sectional view of an organic light-emitting display according to an embodiment.

FIG. 2 is a schematic cross-sectional view of an organic light-emitting display according to another embodiment.

FIG. 3 is a schematic cross-sectional view of an organic light-emitting display according to another embodiment.

DETAILED DESCRIPTION

Hereinafter, certain embodiments will be described in detail with reference to the accompanying drawings.

FIG. 1 is a schematic cross-sectional view of an organic light-emitting display 100 according to an embodiment. Referring to FIG. 1, the display 100 includes a substrate 101, a thin film transistor (TFT), a first electrode 114, an intermediate layer 116, a second electrode 117, and an optical blocking unit (or optical blocking portion) 111. The TFT includes a gate electrode 103, an active layer 107, a source electrode 109, and a drain electrode 110. The source electrode 109 or the drain electrode 110 includes the optical blocking unit 111.

The substrate 101 may be formed of a glass material, the main ingredient of which is SiO₂ but is not limited thereto and may be formed of any transparent plastic material. The transparent plastic material may be an insulating organic material selected from the group consisting of polyethersulphone (PES), polyacrylate (PAR), polyetherimide (PEI), polyethylenenaphthalate (PEN), polyethyleneterephthalate (PET), polyphenylene sulfide (PPS), polyallylate, polyimide, polycarbonate (PC), cellulose triacetate (TAC), and cellulose acetate propionate (CAP).

Although not shown, a buffer layer may be formed on the substrate 101 to provide a planar surface on the substrate 101 and to prevent moisture or foreign substances from permeating into the substrate 101. This applies to the embodiments of FIGS. 1 and 2.

The gate electrode 103 is formed on the substrate 101. The gate electrode 103 may be formed of at least one material selected from the group consisting of Au, Ag, Cu, Ni, Pt, Pd, Al, Mo, an Al:Nd alloy, and a Mo:W alloy but is not limited thereto and may include various conductive materials.

A first capacitor electrode 104 is formed on the substrate 101. The first capacitor electrode 104 may be formed of the same material as the gate electrode 103. In one embodiment, the first capacitor electrode 104 is simultaneously formed with the gate electrode 103 by performing a patterning process only once.

A gate insulating layer **106** is formed on the gate electrode **103** and the first capacitor electrode **104**. The gate insulating layer **106** insulates the gate electrode **103** and the active layer **107** from each other.

The active layer **107** is formed on the gate insulating layer **106**. The active layer **107** may include various materials. The active layer **107** may include an oxide semiconductor material but is not limited thereto and may include crystalline silicon or amorphous silicon.

An etch stopper **108** is formed on the active layer **107**. The source electrode **109** and the drain electrode **110** are formed on the etch stopper **108**. The source electrode **109** and the drain electrode **110** contact an exposed region of the active layer **107**, which is not covered by the etch stopper **108**.

That is, a region that acts as a channel of surfaces of the active layer **107** is protected by the etch stopper **108**. The etch stopper **108** prevents an upper surface of the active layer **107** from being damaged during an etch process for patterning the source electrode **109** and the drain electrode **110**. The etch stopper **108** may be formed of various insulating materials.

Each of the source electrode **109** and the drain electrode **110** may be formed, but is not limited to, of at least one material selected from the group consisting of Au, Pd, Pt, Ni, Rh, Ru, Ir, Os, Al, Mo, an Al:Nd alloy, and a MoW alloy.

In one embodiment, the source electrode **109** or the drain electrode **110** includes the optical blocking unit **111**. In another embodiment, each of the source electrode **109** and the drain electrode **110** includes the optical blocking unit **111**. If only one of the electrodes **109** and **110** includes the optical unit **111**, the electrode having the optical unit **111** may be formed to be closer to the light emitting region than the other electrode to efficiently block light from entering the TFT or at least the active layer **107**. This applies to the embodiments of FIGS. 2 and 3. In the current embodiment, the drain electrode **110** includes the optical blocking unit **111**. The optical blocking unit **111** extends from a region of the drain electrode **110**. In one embodiment, the unit **111** extends in a thickness direction of the substrate **101**, i.e., a Y-axis direction in FIG. 1.

In one embodiment, the optical blocking unit **111** is formed of the same material as the drain electrode **110** and thus prevents light from penetrating into the active layer **107**. In particular, the optical blocking unit **111** prevents light generated from the intermediate layer **116** from being incident on a side or bottom surface of the active layer **107**. In one embodiment, the optical blocking unit **111** is formed to partially overlap the gate electrode **103** in a direction substantially perpendicular to the thickness direction of the substrate **101**, i.e., an X-axis direction in FIG. 1. For example, the optical blocking unit **111** may be formed on the same layer on which the gate electrode **103** is formed. That is, the optical blocking unit **111** is formed to contact the substrate **101**. If the buffer layer is formed, the optical blocking unit **111** is formed to contact the buffer layer.

A second capacitor electrode **112** is formed on the etch stopper **108** to overlap the first capacitor electrode **104**. The first capacitor electrode **104** and the second capacitor electrode **112** together form one capacitor C. The second capacitor electrode **112** may be formed of the same material as the source electrode **109** and the drain electrode **110**. In one embodiment, the second capacitor electrode **112** is substantially simultaneously formed with the source electrode **109** and the drain electrode **110** by performing a patterning process only once.

A passivation layer **113** is formed on the source electrode **109**, the drain electrode **110**, and the second capacitor

electrode **112**. The passivation layer **113** may be formed of various insulating materials including organic or inorganic materials. Also, the passivation layer **113** may have a stacked structure of organic and inorganic materials. The passivation layer **113** includes a via-hole **113a** for exposing a region of the drain electrode **110**.

The first electrode **114** is formed on the passivation layer **113**. The first electrode **114** is electrically connected to the drain electrode **110** via the via-hole **113a**. The first electrode **114** may be a transmissive electrode or a reflective electrode.

If the first electrode **114** is a transmissive electrode, then the first electrode **114** may include ITO, IZO, ZnO, or In₂O₃. Otherwise, if the first electrode **114** is a reflective electrode, then the first electrode **114** may be fabricated by forming a reflective layer by using at least one material selected from the group consisting of Ag, Mg, Al, Pt, Pd, Au, Ni, Nd, Ir, and Cr and forming an ITO, IZO, ZnO, or In₂O₃ layer on the resultant structure.

In the current embodiment, the drain electrode **110** is electrically connected to the first electrode **114** but this arrangement is not considered limiting and the source electrode **109** may be connected to the first electrode **114**. If the source electrode **109** is electrically connected to the first electrode **114**, the source electrode **109** includes the optical blocking unit **111**.

A pixel defining layer **115** is formed on the first electrode **114**. The pixel defining layer **115** may include various insulating materials and may be formed to expose a predetermined region of the first electrode **114**. The intermediate layer **116** is formed on the exposed region of the first electrode **114**. The second electrode **117** is formed on the intermediate layer **116**.

The intermediate layer **116** includes an organic emission layer (not shown). When a voltage is applied to the first electrode **114** and the second electrode **117**, visible light is emitted from the organic emission layer of the intermediate layer **116**.

If the organic emission layer of the intermediate layer **116** is a low-molecular weight organic layer, then a hole transport layer (HTL) and a hole injection layer (HIL) may be included between the organic emission layer and the first electrode **114** and an electron transport layer (ETL) and an electron injection layer (EIL) may be included between the organic emission layer and the second electrode **117**.

If the organic emission layer of the intermediate layer **116** is a high molecular weight organic layer, then the HTL may be included between the organic emission layer and the first electrode **114**.

The second electrode **117** is formed to substantially cover all pixels. The second electrode **117** may be a transmissive or reflective electrode.

If the second electrode **117** is a transmissive electrode, then the second electrode **117** may be fabricated by stacking a layer formed of at least one material selected from the group consisting of Li, Ca, LiF/Ca, LiF/Al, Al, Ag, and Mg, and a transmissive conductive layer, such as ITO, IZO, ZnO, or In₂O₃. Alternatively, if the second electrode **117** is a reflective electrode, then the second electrode **117** is formed of at least one material selected from the group consisting of Li, Ca, LiF/Ca, LiF/Al, Al, Ag, and Mg.

In the current embodiment, the first electrode **114** and the second electrode **117** are an anode electrode and a cathode electrode, respectively. In another embodiment, the first electrode **114** and the second electrode **117** may be a cathode electrode and an anode electrode, respectively. Also, the

above-described materials of the first electrode **114** and the second electrode **117** are just examples and various materials may be used to form them.

A sealing unit (not shown) may be formed on the second electrode **117**. In one embodiment, the sealing unit is formed of a transparent material to protect the intermediate layer **116** and the other layers from external moisture or oxygen. The sealing unit may include glass, plastic, or a plurality of stacked layers including organic and inorganic materials.

In the organic light-emitting display **100**, the drain electrode **110** includes the optical blocking unit **111**. The optical blocking unit **111** extends in the thickness direction of the substrate **101** and thus prevents light from being incident on a side surface of the active layer **107**.

The characteristics of the active layer **107** are likely to be changed by light, thereby degrading the optical reliability of the TFT. In particular, when the active layer **107** includes an oxide semiconductor material, the active layer **107** is very sensitive to light.

However, in the current embodiment, the active layer **107** is prevented from being exposed to light so that the characteristics of the active layer **107** may not change, thereby preventing the optical reliability of the TFT from degrading. In particular, light generated from the intermediate layer **116** is prevented from being incident on the side surface of the active layer **107**, thereby protecting the active layer **107** from light.

The image quality of the organic light-emitting display **100** is generally influenced by the characteristics of the TFT. In the current embodiment, the active layer **107** included in the TFT is prevented from degrading due to light, and thus, the optical reliability of the TFT is enhanced and the image quality of the organic light-emitting display **100** is improved accordingly.

In one embodiment, the optical blocking unit **111** is formed to reach the same layer on which the gate electrode **103** is formed. That is, the optical blocking unit **111** is formed to contact the substrate **101**, thereby maximizing the blocking of light incident on the active layer **107**.

Also, the optical blocking unit **111** partially overlaps the via-hole **113a** so that the thickness of a region of the drain electrode **110** that contacts the first electrode **114** may be increased, thus reducing contact resistance in an interface region between the first electrode **114** and the drain electrode **110**. Furthermore, light incident from the intermediate layer **116** onto the active layer **107** may be blocked effectively.

FIG. 2 is a schematic cross-sectional view of an organic light-emitting display **200** according to another embodiment. For convenience of explanation, the organic light-emitting display **200** will now be described focusing on the differences with respect to the FIG. 1 embodiment.

Referring to FIG. 2, the organic light-emitting display **200** includes a substrate **201**, a TFT, a first electrode **214**, an intermediate layer **216**, a second electrode **217**, a conductive unit **205**, and an optical blocking unit **211**. The TFT includes a gate electrode **203**, an active layer **207**, a source electrode **209**, and a drain electrode **210**. The source electrode **209** or the drain electrode **210** includes the optical blocking unit **211**. The gate electrode **203** is formed on the substrate **201**. A first capacitor electrode **204** is formed on the substrate **201**. The first capacitor electrode **204** may be formed of the same material as the gate electrode **203**.

The conductive unit **205** is also formed on the substrate **201** to be disposed apart from the gate electrode **203**. The conductive unit **205** is formed of the same material as the gate electrode **203**. The gate electrode **203** and the conduc-

tive unit **205** may be formed substantially simultaneously by performing a patterning process once.

A gate insulating layer **206** is formed on the gate electrode **203**, the first capacitor electrode **204**, and the conductive unit **205**. The active layer **207** is formed on the gate insulating layer **206**. An etch stopper **208** is formed on the active layer **207**, and the source electrode **209** and the drain electrode **210** are formed on the etch stopper **208**. The source electrode **209** and the drain electrode **210** contact an exposed region of the active layer **207**, which is not covered by the etch stopper **208**.

The source electrode **209** or the drain electrode **210** includes the optical blocking unit **211**. In the current embodiment, the drain electrode **210** includes the optical blocking unit **211**. The optical blocking unit **211** extends from a region of the drain electrode **210**, and more particularly, extends in a thickness direction of the substrate **201**, i.e., a Y-axis direction in FIG. 2. The optical blocking unit **211** is connected to the conductive unit **205**.

In one embodiment, the optical blocking unit **211** is formed of the same material as the drain electrode **210** and blocks light from being incident on the active layer **207**. The optical blocking unit **211** is formed to be connected to the conductive unit **205**, on the same layer on which the gate electrode **203** is formed, and thus, the optical blocking unit **211** and the conductive unit **205** effectively prevent light from being incident on a side or bottom surface of the active layer **207**.

A second capacitor electrode **212** is formed on the etch stopper **208** to overlap the first capacitor electrode **204**. The first capacitor electrode **204** and the second capacitor electrode **212** together form one capacitor C.

A passivation layer **213** is formed on the source electrode **209**, the drain electrode **210**, and the second capacitor electrode **212**. The passivation layer **213** includes a via-hole **213a** to expose a region of the drain electrode **210**.

The first electrode **214** is formed on the passivation layer **213**. The first electrode **214** is electrically connected to the drain electrode **210** via the via-hole **213a**. In the current embodiment, the drain electrode **210** is electrically connected to the first electrode **214**. However, the source electrode **209** may be connected to the first electrode **214**. When the source electrode **209** is connected to the first electrode **214**, the source electrode **209** includes the optical blocking unit **211**.

A pixel defining layer **215** is formed on the first electrode **214**. The pixel defining layer **215** may include various insulating materials and exposes a predetermined region of the first electrode **214**. The intermediate layer **216** is formed on the exposed region of the first electrode **214**. The second electrode **217** is formed on the intermediate layer **216**.

A sealing unit (not shown) may be formed on the second electrode **217**. The sealing unit protects the intermediate layer **216** and the other layers from external moisture or oxygen. The sealing unit may include glass, plastic, or a plurality of stacked layers including organic and inorganic materials.

In the organic light-emitting display **200**, the drain electrode **210** includes the optical blocking unit **211**. The optical blocking unit **211** extends in the thickness direction of the substrate **201**, and is also connected to the conductive unit **205**. Thus, it is possible to prevent the properties of the active layer **207** from degrading due to light by blocking light from being incident on a side or bottom surface of the active layer **207**, thereby improving the image quality of the organic light-emitting display **200**.

For example, the optical blocking unit **211** does not need to extend to the substrate **201** owing to the conductive unit **205**, thereby simplifying a process of forming the optical blocking unit **211**.

Also, the optical blocking unit **211** partially overlaps the via-hole **213a**, and thus, the thickness of the drain electrode **210** that contacts the first electrode **214** is increased, thus reducing contact resistance in an interface region between the first electrode **214** and the drain electrode **210**. Furthermore, it is possible to effectively block light from being incident from the intermediate layer **216** onto the active layer **207**.

FIG. 3 is a schematic cross-sectional view of an organic light-emitting display **300** according to another embodiment. For convenience of explanation, the organic light-emitting display **300** will now be described focusing on the differences with respect to the embodiments shown in FIGS. 1 and 2.

Referring to FIG. 3, the organic light-emitting display **300** includes a substrate **301**, a TFT, a first electrode **314**, an intermediate layer **316**, a second electrode **317**, and an optical blocking unit **311**. The TFT includes a gate electrode **303**, an active layer **307**, a source electrode **309**, and a drain electrode **310**. The source electrode **309** or the drain electrode **310** includes the optical blocking unit **311**.

Specifically, the gate electrode **303**, a first capacitor electrode **304**, and the first electrode **314** are formed on the substrate **301**. The gate electrode **303** includes a first conductive layer **303a** and a second conductive layer **303b**. Each of the first conductive layer **303a** and the second conductive layer **303b** may be formed of various materials. For example, the first conductive layer **303a** may be formed of a transmissive conductive material, such as ITO, IZO, or In_2O_3 , and the second conductive layer **303b** may be formed of at least one material selected from the group consisting of Mo, W, Al, Cu, and Ag.

The first capacitor electrode **304** includes a first layer **304a** and a second layer **304b**. The first capacitor electrode **304** may be formed of the same material as the gate electrode **303**. That is, the first layer **304a** may be formed of the same material as the first conductive layer **303a** and the second layer **304b** may be formed of the same material as the second conductive layer **303b**.

The first electrode **314** is formed on the substrate **301** to be disposed apart from the gate electrode **303** and may be formed of the same material as the first conductive layer **303a** of the gate electrode **303**.

The gate electrode **303**, the first capacitor electrode **304**, and the first electrode **314** may be patterned substantially simultaneously. In this regard, photolithography may be performed using a half-tone mask.

A gate insulating layer **306** is formed on the gate electrode **303**, the first capacitor electrode **304**, and the first electrode **314**. The active layer **307** is formed on the gate insulating layer **306**. An etch stopper **308** is formed on the active layer **307**, and the source electrode **309** and the drain electrode **310** are formed on the etch stopper **308**. The source electrode **309** and the drain electrode **310** contact exposed regions of the active layer **307** that are not covered by the etch stopper **308**, respectively.

The drain electrode **310** is electrically connected to the first electrode **314**. The gate insulating layer **306** and the etch stopper **308** are etched from the first electrode **314** so as to expose a region of the first electrode **314**, and the drain electrode **310** is connected to the exposed region of the first electrode **314**.

The source electrode **309** or the drain electrode **310** includes the optical blocking unit **311**. In the current embodiment, the drain electrode **310** includes the optical blocking unit **311**. The optical blocking unit **311** extends from a region of the drain electrode **310**, and more particularly, extend in a thickness direction of the substrate **301**, i.e., a Y-axis direction in FIG. 3.

Also, the optical blocking unit **311** partially overlaps the gate electrode **303** in a direction substantially perpendicular to the thickness direction of the substrate **301**, i.e., an X-axis direction. For example, the optical blocking unit **311** contacts a side surface of the first electrode **314**. The optical blocking unit **311** may contact a side surface of the first electrode **314** facing the gate electrode **303**. Also, the optical blocking unit **311** is formed to cover an interface region between a side surface of the first electrode **314** and the substrate **301**.

Although not shown, if the buffer layer is formed between the substrate **301** and the first electrode **314**, the optical blocking unit **311** is formed to cover an interface region between a side surface of the first electrode **314** and the buffer layer.

In one embodiment, the optical blocking unit **311** is formed of the same material as the drain electrode **310** and blocks light from being incident on the active layer **307**. According to one embodiment, since the optical blocking unit **311** contacts the side surface of the first electrode **314**, light generated from the intermediate layer **316** may be effectively prevented from being incident on a side or bottom surface of the active layer **307** via the side surface of the first electrode **314**.

A second capacitor electrode **312** is formed on the etch stopper **308** to overlap the first capacitor electrode **304**. The first capacitor electrode **304** and the second capacitor electrode **312** together form one capacitor C.

A pixel defining layer **315** is formed on the source electrode **309**, the drain electrode **310**, and the second capacitor electrode **312**. Predetermined regions of the pixel defining layer **315**, the gate insulating layer **306**, and the etch stopper **308** are etched to expose a region of the first electrode **314**. The intermediate layer **316** is formed on the exposed region of the first electrode **314**. The second electrode **317** is formed on the intermediate layer **316**.

In the current embodiment, since the pixel defining layer **315** also acts as a passivation layer, the thickness of the organic light-emitting display **300** decreases and the efficiency of a process of fabricating the display **300** increases.

A sealing unit (not shown) may be formed on the second electrode **317**. The sealing unit protects the intermediate layer **316** and the other layers from external moisture or oxygen. The sealing unit may be formed of a transparent material. The sealing unit may include glass, plastic, or a plurality of stacked layers including organic and inorganic materials.

In the organic light-emitting display **300**, the drain electrode **310** includes the optical blocking unit **311**. The optical blocking unit **311** extends in the thickness direction of the substrate **301**. Also, the optical blocking unit **311** contacts the side surface of the first electrode **314** facing the gate electrode **303**, thereby blocking light from being incident on a side or bottom surface of the active layer **307**. Also, light passing through a side surface of the first electrode **314** is prevented from being incident on the active layer **307**. Accordingly, the performance of the active layer **307** is not degraded by light, and thus, the image quality of the display **300** is enhanced.

Thus, it is possible to improve image quality.

11

While certain embodiments have been particularly shown and described, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope of the following claims.

What is claimed is:

1. An organic light-emitting display comprising:
a substrate;
a thin film transistor formed on the substrate, and comprising i) a gate electrode, ii) an active layer electrically insulated from the gate electrode, wherein the active layer has top and bottom surfaces opposing each other and a side surface interposed between the top and bottom surfaces and iii) source and drain electrodes that are electrically connected to the top surface of the active layer;
a first electrode electrically connected to the thin film transistor;
an intermediate layer formed on the first electrode and comprising an organic emission layer; and
a second electrode formed on the intermediate layer, wherein the source electrode or the drain electrode [has] includes i) a body portion and ii) an optical blocking portion integrally formed with the body portion and directly extending from the body portion in the direction of substrate thickness, [and] wherein the optical blocking portion is closer to the substrate than the bottom surface of the active layer, wherein the active layer is closer to the substrate than the intermediate layer, wherein the active layer includes a connect region directly connected to the source and drain electrodes, wherein the optical blocking portion is closer to the substrate than the connect region, wherein the optical blocking portion or the body portion contacts the first electrode, wherein the optical blocking portion is disposed in a hole of at least an insulating layer, and wherein the optical blocking portion fully fills the hole of the insulating layer.
2. The organic light-emitting display of claim 1, wherein the source electrode or the drain electrode is electrically connected to the first electrode,
and wherein the source or drain electrode that is connected to the first electrode comprises the optical blocking portion.
3. The organic light-emitting display of claim 1, wherein the active layer is formed at least partially of an oxide semiconductor material.
4. The organic light-emitting display of claim 1, wherein the gate electrode is formed on the substrate,
wherein the active layer is formed over the gate electrode, and
wherein the optical blocking portion includes a region that overlaps with at least part of the gate electrode in a direction substantially perpendicular to the substrate thickness.
5. The organic light-emitting display of claim 4, wherein the optical blocking portion contacts the substrate.
6. The organic light-emitting display of claim 4, further comprising a buffer layer formed between the substrate and the thin film transistor,
wherein the optical blocking portion contacts the buffer layer.
7. The organic light-emitting display of claim 4, further comprising a passivation layer disposed between the thin film transistor and the first electrode, the passivation layer including a via-hole,

12

- wherein the source electrode or the drain electrode is connected to the first electrode by way of the via-hole, and
wherein the optical blocking portion includes a region that overlaps with at least part of the via-hole in the thickness direction of the substrate.
8. The organic light-emitting display of claim 1, wherein the gate electrode is formed on the substrate, and wherein the active layer is formed on the gate electrode[, wherein the organic light-emitting display further comprising a conductive unit formed on the substrate to be disposed apart from the gate electrode, and wherein the optical blocking portion and the conductive unit are connected to each other].
 9. The organic light-emitting display of claim 8, wherein the conductive unit and the gate electrode are formed of the same material.
 10. The organic light-emitting display of claim 8, further comprising a passivation layer disposed between the thin film transistor and the first electrode, the passivation layer including a via-hole,
wherein the source electrode or the drain electrode is electrically connected to the first electrode via the via-hole, and
wherein the optical blocking portion includes a region that overlaps with at least part of the via-hole in the thickness direction of the substrate.
 11. The organic light-emitting display of claim 1, wherein the gate electrode and the first electrode are formed on the substrate to be disposed apart from each other,
wherein the active layer is formed on the gate electrode, and
wherein the optical blocking portion includes a region that overlaps with at least part of the gate electrode in a direction substantially perpendicular to the thickness direction of the substrate.
 12. [The] An organic light-emitting display [of claim 11], comprising:
a substrate;
a thin film transistor formed on the substrate, and comprising i) a gate electrode, ii) an active layer electrically insulated from the gate electrode, wherein the active layer has top and bottom surfaces opposing each other and a side surface interposed between the top and bottom surfaces and iii) source and drain electrodes that are electrically connected to the top surface of the active layer;
a first electrode electrically connected to the thin film transistor;
an intermediate layer formed on the first electrode and comprising an organic emission layer; and
a second electrode formed on the intermediate layer, wherein the source electrode or the drain electrode includes i) a body portion and ii) an optical blocking portion integrally formed with the body portion and directly extending from the body portion in the direction of substrate thickness, and wherein the optical blocking portion is closer to the substrate than the bottom surface of the active layer,
wherein the gate electrode and the first electrode are formed on the substrate to be disposed apart from each other,
wherein the active layer is formed on the gate electrode, wherein the optical blocking portion includes a region that overlaps with at least part of the gate electrode in a direction substantially perpendicular to the thickness direction of the substrate, and

13

wherein the optical blocking portion contacts a side surface of the first electrode.

13. [The] An organic light-emitting display [of claim 11], comprising:

a substrate;

a thin film transistor formed on the substrate, and comprising i) a gate electrode, ii) an active layer electrically insulated from the gate electrode, wherein the active layer has top and bottom surfaces opposing each other and a side surface interposed between the top and bottom surfaces and iii) source and drain electrodes that are electrically connected to the top surface of the active layer;

a first electrode electrically connected to the thin film transistor;

an intermediate layer formed on the first electrode and comprising an organic emission layer; and

a second electrode formed on the intermediate layer,

wherein the source electrode or the drain electrode includes i) a body portion and ii) an optical blocking portion integrally formed with the body portion and directly extending from the body portion in the direction of substrate thickness, and wherein the optical blocking portion is closer to the substrate than the bottom surface of the active layer,

wherein the gate electrode and the first electrode are formed on the substrate to be disposed apart from each other,

wherein the active layer is formed on the gate electrode, wherein the optical blocking portion includes a region that overlaps with at least part of the gate electrode in a direction substantially perpendicular to the thickness direction of the substrate, and

wherein the optical blocking portion contacts a side surface of the first electrode facing the gate electrode.

14. [The] An organic light-emitting display [of claim 11], comprising:

a substrate;

a thin film transistor formed on the substrate, and comprising i) a gate electrode, ii) an active layer electrically insulated from the gate electrode, wherein the active layer has top and bottom surfaces opposing each other and a side surface interposed between the top and bottom surfaces and iii) source and drain electrodes that are electrically connected to the top surface of the active layer;

a first electrode electrically connected to the thin film transistor;

an intermediate layer formed on the first electrode and comprising an organic emission layer; and

a second electrode formed on the intermediate layer,

wherein the source electrode or the drain electrode includes i) a body portion and ii) an optical blocking portion integrally formed with the body portion and directly extending from the body portion in the direction of substrate thickness, and wherein the optical blocking portion is closer to the substrate than the bottom surface of the active layer,

wherein the gate electrode and the first electrode are formed on the substrate to be disposed apart from each other,

wherein the active layer is formed on the gate electrode, wherein the optical blocking portion includes a region that overlaps with at least part of the gate electrode in a direction substantially perpendicular to the thickness direction of the substrate, and

14

wherein the optical blocking portion at least partially covers a side surface of the first electrode, which contacts the substrate.

15. [The] An organic light-emitting display [of claim 11, further] comprising:

a substrate;

a thin film transistor formed on the substrate, and comprising i) a gate electrode, ii) an active layer electrically insulated from the gate electrode, wherein the active layer has top and bottom surfaces opposing each other and a side surface interposed between the top and bottom surfaces and iii) source and drain electrodes that are electrically connected to the top surface of the active layer;

a first electrode electrically connected to the thin film transistor;

an intermediate layer formed on the first electrode and comprising an organic emission layer; and

a second electrode formed on the intermediate layer,

a buffer layer disposed between the substrate and the first electrode,

wherein the source electrode or the drain electrode includes i) a body portion and ii) an optical blocking portion integrally formed with the body portion and directly extending from the body portion in the direction of substrate thickness, wherein the optical blocking portion is closer to the substrate than the bottom surface of the active layer,

wherein the gate electrode and the first electrode are formed on the substrate to be disposed apart from each other,

wherein the active layer is formed on the gate electrode, wherein the optical blocking portion includes a region that overlaps with at least part of the gate electrode in a direction substantially perpendicular to the thickness direction of the substrate, and

wherein the optical blocking portion at least partially covers a side surface of the first electrode that contacts the buffer layer.

16. An organic light-emitting display comprising:

a thin film transistor (TFT) formed on a substrate, wherein the TFT comprises i) a gate electrode, ii) an active layer electrically insulated from the gate electrode wherein the active layer has top and bottom surfaces opposing each other and a side surface interposed between the top and bottom surfaces, and iii) source and drain electrodes electrically connected to the top surface of the active layer;

a first electrode electrically connected to the TFT;

an organic light emission layer formed on the first electrode and configured to emit light; and

a second electrode formed on the organic light emission layer,

wherein [a portion of] at least one of the source electrode and the drain electrode includes i) a body portion and ii) a portion integrally formed with the body portion, wherein the portion directly extends from the body portion in the direction of substrate thickness and is configured to substantially block the emitted light from entering the active layer of the TFT, [and] wherein the portion is closer to the substrate than the bottom surface of the active layer, wherein the active layer is closer to the substrate than the organic light emission layer, wherein the active layer includes a connect region directly connected to the source and drain electrodes, wherein the portion is closer to the substrate than the connect region, wherein the portion or the body portion

15

contacts the first electrode, wherein the portion is disposed in a hole of at least an insulating layer, and wherein the portion fully fills the hole of the insulating layer.

17. The organic light-emitting display of claim 16, wherein only one of the source and drain electrodes includes the portion, and wherein the electrode having the portion is formed to be closer to the organic light emitting layer than the other electrode.

18. The organic light-emitting display of claim 16, further comprising a gate insulating layer formed between the gate electrode and active layer, wherein the portion at least partially penetrates the gate insulating layer.

19. The organic light-emitting display of claim 18, wherein the portion substantially completely penetrates the gate insulating layer.

20. The organic light-emitting display of claim 19, wherein the portion contacts the substrate or a conductive unit formed between the portion and substrate.

21. The organic light-emitting display of claim 1, wherein the optical blocking portion directly contacts the first electrode.

22. An organic light-emitting display comprising:
a substrate;

a conductive unit formed on the substrate;

a thin film transistor comprising a gate electrode, an active layer including an oxide semiconductor material, a first insulating layer between the gate electrode and active layer, a source electrode and a drain electrode;

an anode electrode connected to the drain electrode;
an intermediate layer formed on the anode electrode and comprising an organic emission layer; and
a cathode electrode formed on the intermediate layer, wherein the drain electrode includes a body portion and an extending portion integrally formed with the body portion, wherein the extending portion is connected to the conductive unit, wherein the first insulating layer is formed on the conductive unit, wherein the extending portion is disposed in a contact hole of at least the first insulating layer, and wherein the extending portion fully fills the hole of the first insulating layer.

23. The organic light-emitting display of claim 22, wherein the extending portion is connected to the conductive unit through the contact hole.

24. The organic light-emitting display of claim 23, wherein the conductive unit includes at least one material selected from the group consisting of Au, Ag, Cu, Ni, Pt, Pd, Al, and Mo.

25. The organic light-emitting display of claim 24, wherein the conductive unit contacts the substrate.

26. The organic light-emitting display of claim 25, wherein the extending portion includes a region extending in a direction substantially perpendicular to the substrate.

16

27. The organic light-emitting display of claim 26, further comprising a buffer layer formed between the substrate and the thin film transistor, wherein the extending portion contacts the buffer layer.

28. The organic light-emitting display of claim 24, wherein the extending portion includes a region extending in a direction substantially perpendicular to the substrate.

29. The organic light-emitting display of claim 24, further comprising a buffer layer formed between the substrate and the thin film transistor, wherein the extending portion contacts the buffer layer.

30. The organic light-emitting display of claim 23, wherein the conductive unit contacts the substrate.

31. The organic light-emitting display of claim 23, wherein the extending portion includes a region extending in a direction substantially perpendicular to the substrate.

32. The organic light-emitting display of claim 23, further comprising a buffer layer formed between the substrate and the thin film transistor, wherein the extending portion contacts the buffer layer.

33. The organic light-emitting display of claim 22, wherein the conductive unit includes at least one material selected from the group consisting of Au, Ag, Cu, Ni, Pt, Pd, Al, and Mo.

34. The organic light-emitting display of claim 33, wherein the conductive unit contacts the substrate.

35. The organic light-emitting display of claim 33, wherein the extending portion includes a region extending in a direction substantially perpendicular to the substrate.

36. The organic light-emitting display of claim 33, further comprising a buffer layer formed between the substrate and the thin film transistor, wherein the extending portion contacts the buffer layer.

37. The organic light-emitting display of claim 22, wherein the conductive unit contacts the substrate.

38. The organic light-emitting display of claim 37, wherein the extending portion includes a region extending in a direction substantially perpendicular to the substrate.

39. The organic light-emitting display of claim 37, further comprising a buffer layer formed between the substrate and the thin film transistor, wherein the extending portion contacts the buffer layer.

40. The organic light-emitting display of claim 22, wherein the extending portion includes a region extending in a direction substantially perpendicular to the substrate.

41. The organic light-emitting display of claim 40, further comprising a buffer layer formed between the substrate and the thin film transistor, wherein the extending portion contacts the buffer layer.

42. The organic light-emitting display of claim 22, further comprising a buffer layer formed between the substrate and the thin film transistor, wherein the extending portion contacts the buffer layer.

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