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(56) Related Art Documents
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Number of Claim(s): 17

(54) ORGANIC ELECTROLUMINESCENCE ELEMENT AND MANUFACTURING METHOD THEREOF

(57) ABSTRACT

The present disclosure relates to an organic electroluminescence element and a manufacturing method thereof: when forming an organic electroluminescence element including a thin film transistor with a bottom-gate structure in which a semiconductor layer is formed of an amorphous silicon layer, forming a light-blocking film on at least one region of an upper or lower part of the thin film transistor to block the influence of light from the outside or generated in an organic film layer to the semiconductor layer, particularly a channel region of the thin film transistor.

The organic electroluminescence element and the manufacturing method thereof according to the present disclosure may include an insulation substrate, a lower light-blocking film formed on the substrate, a gate electrode/gate insulation layer formed on the light-blocking film, an amorphous silicon layer formed at an upper part of the gate insulation layer having high concentrated impurities doped into a certain region, a source/drain electrode formed on the region of the amorphous silicon layer with high concentrated impurities doped into, an insulation layer formed on the substrate and opened on a certain region of the source/drain electrode, a first electrode contacted to the source/drain electrode through the opened region of the insulation layer and formed on a pixel region, a light-blocking film formed at an upper part of the source/drain electrode, the amorphous silicon layer, and the insulation layer, and an organic film layer configured to be formed on the pixel region and include at least an organic light-emitting layer, and a second electrode, in which the light-blocking film and the lower light-blocking film are formed from one of metals among Ag, Cr, Pd, Mo, and MoW.

Accordingly, the organic electroluminescence element and the manufacturing method thereof according to the present disclosure, when forming an organic electroluminescence element including a bottom-gate thin film transistor in which a semiconductor layer is formed of an amorphous silicon, a light-blocking film may be formed on at least one of the upper and lower parts of the thin film transistor, and a light-blocking film may be formed on the semiconductor layer of the thin film transistor, particularly, on the channel region of the semiconductor layer to block light emitted from the outside or inside, thereby providing not only excellent thin film transistor properties, but also a simple process in which the semiconductor layer is formed by using amorphous silicon.

MAIN DRAWING

FIG. 2E

WHAT IS CLAIMED IS:

1.

An organic electroluminescence element, comprising:

an insulation substrate;

a lower light-blocking film formed on the substrate;

a gate electrode/gate insulation layer formed on the light-blocking film;

an amorphous silicon layer formed at an upper part of the gate insulation layer having high concentrated impurities doped into a certain region;

a source/drain electrode formed on the region of the amorphous silicon layer doped with high concentrated impurities;

an insulation layer formed on the substrate and opened on a certain region of the source/drain electrode;

a first electrode contacted to the source/drain electrode through the opened region of the insulation layer and formed on a pixel region;

a light-blocking film formed at an upper part of the source/drain electrode, the amorphous silicon layer, and the insulation layer; and

an organic film layer configured to be formed on the pixel region and include at least an organic light-emitting layer, and a second electrode,

wherein the light-blocking film and the lower light-blocking film are formed from one of metals among Ag, Cr, Pd, Mo, and MoW.

2.
Removed

3.
Removed

4.
Removed

5.

The organic electroluminescence element of claim 1, wherein the light-blocking film is formed following a morphology of the insulation layer.

6.

The organic electroluminescence element of claim 1, wherein the gate insulation layer and the amorphous silicon layer are consecutively formed.

7.

The organic electroluminescence element of claim 1, wherein the amorphous silicon layer doped with high concentrated impurities is formed by doping impurities, or by forming an amorphous silicon layer without high concentrated impurities doped into and consecutively laminating an amorphous silicon layer doped with high concentrated impurities thereon.

8.

The organic electroluminescence element of claim 1, wherein the first electrode is a transparent electrode such as ITO and IZO.

9.

The organic electroluminescence element of claim 1, wherein the first electrode has a laminated structure of a reflection film, and transparent electrodes such as ITO and IZO.

10.

The organic electroluminescence element of claim 1, wherein the second electrode is at least one of a transparent conductor or a metal.

11.

The organic electroluminescence element of claim 1, wherein a planarization layer is further included between the light-blocking film and the first electrode.

12.

The organic electroluminescence element of claim 1, wherein a pixel defining layer is further included between the first electrode and the organic film layer.

13.

A manufacturing method of an organic electroluminescence element, comprising:

preparing an insulation substrate;

forming a lower light-blocking film on the substrate;

forming a gate electrode on the lower light-blocking film;

forming a gate insulating film and an amorphous silicon layer doped with high concentrated impurities to a certain thickness from an upper part thereof, on the substrate with the gate electrode formed thereon;

forming a conductor layer on the amorphous silicon layer;

patterning the conductor using a photoresist pattern to form a source/drain electrode, and etching from an upper part of the amorphous silicon layer to a certain thickness and width to form a source/drain electrode region and channel;

forming an insulation layer on the substrate;

forming a light-blocking film on the substrate by depositing and patterning a light-blocking film forming material;

etching a certain region of the insulation layer to expose the source/drain electrode; and

forming a first electrode contacted to the exposed source/drain electrode through the opened insulation layer, and an organic film layer including at least an organic light-emitting layer and a second electrode,

wherein forming the light-blocking film is depositing one of metals among Ag, Cr, Pd, Mo, and MoW on the substrate.

14.
Removed

15.

The manufacturing method of an organic electroluminescence element of claim 13, wherein forming the amorphous silicon layer doped with high concentrated impurities to a certain thickness from the upper part thereof is doping high concentrated impurities into a prepared amorphous silicon layer, or consecutively laminating an amorphous silicon layer without high concentrated impurities doped into and an amorphous silicon layer doped with high concentrated impurities.

16.

The manufacturing method of an organic electroluminescence element of claim 13, wherein etching from the upper part of the amorphous silicon layer to the certain thickness and width is etching the amorphous silicon layer to the certain thickness and width of the amorphous silicon layer doped with high concentrated impurities.

17.

The manufacturing method of an organic electroluminescence element of claim 13, wherein forming the gate insulation layer and the amorphous silicon layer is consecutively forming the gate insulation layer and the amorphous silicon layer.

18.
Removed

19.

The manufacturing method of an organic electroluminescence element of claim 13, wherein forming the light-blocking film is forming the light-blocking film at the upper part of the source/drain electrode and a semiconductor layer.

20.

The manufacturing method of an organic electroluminescence element of claim 13, wherein forming the planarization layer on the substrate is further included after forming the light-blocking film.

21.

The manufacturing method of an organic electroluminescence element of claim 13, wherein forming the first electrode is depositing and patterning the transparent conductor such as ITO and IZO on the substrate to form the first electrode, or depositing and patterning a laminated structure of a metal layer such as aluminum and the transparent conductor such as ITO and IZO to form the first electrode.

22.

The manufacturing method of an organic electroluminescence element of claim 13, wherein forming the planarization layer on the substrate is further included after forming the first electrode.

APPLICATION

DETAILED DESCRIPTION OF THE EMBODIMENTS

PURPOSE OF THE INVENTION

TECHNICAL FIELD AND THE RELATED ART THEREOF

The present disclosure relates to an organic electroluminescence element and a manufacturing method thereof: more particularly, when forming an organic electroluminescence element including a thin film transistor with a bottom-gate structure in which a semiconductor layer is formed of an amorphous silicon layer, forming a light-blocking film on at least one region of an upper or lower part of the thin film transistor to block the influence of light from the outside or generated in an organic film layer to the semiconductor layer, particularly a channel region of the thin film transistor.

Recently, flat panel display devices such as a liquid crystal display device, an organic electroluminescence display device, and a plasma display plane (PDP) have been recognized for reducing issues with a conventional display element such as a cathode ray tube being heavy and large.

The liquid crystal display device is a light-receiving element not a self-luminous element, having limitations in brightness, contrast, viewing angle, and display enlargement. Although the PDP is a self-luminous element, it is heavier than other flat panel display devices, has high power consumption, and has a complex manufacturing method. In contrast, the organic electroluminescence element is a self-luminous element, having an excellent viewing angle, contrast, etc. It can be lightweight and thin and has a good power consumption because it does not need backlight.

It is also resistant to external impacts and has a wide operating temperature range because it is capable of direct current low-operation, has a fast response speed, and is all solid. A manufacturing thereof is simple and inexpensive as well.

FIGS. 1A to 1D are cross-sectional views showing a manufacturing process of an organic electroluminescence element that includes a thin film transistor with a conventional bottom-gate structure.

First, FIG. 1A is a cross-sectional view showing a process of forming a gate electrode on a substrate, a second electrode of a capacitor, and a semiconductor layer. As shown in the drawing, a buffer layer (12) is formed on a transparent insulation substrate (11) such as plastic or glass to protect an element thereon and the substrate thereunder. Then a material forming the gate electrode and the first electrode of the capacitor is formed and patterned on the entire surface of the substrate to form a gate electrode (13) of a thin film transistor and a first electrode (14) of the capacitor.

An insulation layer (15) made of a silicon oxide film or a silicon nitride film is formed on the entire surface of the substrate, which functions as a gate insulation layer in the thin film transistor region and as a dielectric layer of the capacitor in the capacitor region.

Next, amorphous silicon is deposited on the entire surface of the substrate using chemical vapor deposition or physical vapor deposition, and a region with high concentrated impurities to a certain depth is formed by performing ion implantation and patterned to make a semiconductor layer. Accordingly, the semiconductor layer (16) is formed of an amorphous silicon layer doped with high concentrated impurities to a certain depth (16a) and an amorphous silicon layer without high concentrated impurities doped into (16b) thereunder.

FIG. 1B is a cross-sectional view showing a process of forming a source/drain electrode of the thin film transistor and a second electrode of the capacitor on the substrate, and etching a part of the semiconductor layer to define a source/drain region and a channel region. As shown in the drawing, a material forming the source/drain electrode of the thin film transistor and the second electrode is formed and patterned on the entire surface of the substrate to form a source/drain electrode (17) and a second electrode (18) of the capacitor. Then, a part of the semiconductor layer exposed when forming the source/drain electrode (a region with high concentrated impurities doped into) is etched to define the channel region and the source/drain region.

Next, FIG. 1C is a cross-sectional view showing a process of forming an inter insulation layer on the substrate and forming a first electrode which is a transparent electrode in a pixel region. As shown in the drawing, an inter insulation layer (19) made of a silicon oxide film or a silicon nitride film is formed on the entire surface of the substrate.

A certain region of the inter insulation layer is etched to expose the source/drain electrode, and then, a transparent conductor such as indium tin oxide (ITO) or indium tin oxide (IZO) is deposited and patterned on the entire surface of the substrate to form a first electrode (20) which is a transparent electrode in the pixel region.

FIG. 1D is a cross-sectional view showing a process of forming a planarization layer, an organic film layer, and a second electrode which is a common electrode and completing the organic electroluminescence element. As shown in the drawing, a planarization layer (21) is formed on the substrate with the first electrode thereon. After opening the pixel region of the planarization layer, an organic film layer (22) including at least an organic light-emitting layer is formed and patterned, and a second electrode (23) which is a common electrode is formed, thereby completing the organic electroluminescence element in which the semiconductor layer is formed of an amorphous silicon layer and has the thin film transistor with a bottom-gate structure.

When a reflection film is further included under the first electrode and the second electrode is a transparent electrode, it can be applied as a front-emitting organic electroluminescence element. When the second electrode including the reflection film is formed, the second electrode can be applied as a bottom-emission organic electroluminescence element.

However, the organic electroluminescence element including the thin film transistor with the bottom-gate structure has the semiconductor layer formed of an amorphous silicon layer, having an issue that the channel region of the semiconductor layer is sensitive to light. In order to solve this issue, an attempt was made to form a top-emission organic electroluminescence element, but the reflection film formed under the first electrode burst when forming the first electrode. In addition, although the patterns of the reflection film and the first electrode are separately formed to prevent bursting, the number of masks increases and the process becomes complicated.

PROBLEMS TO BE SOLVED

The present disclosure relates to an organic electroluminescence element and a manufacturing method thereof: when forming an organic electroluminescence element including a thin film transistor with a bottom-gate structure in which a semiconductor layer is formed of an amorphous silicon layer, forming a light-blocking film on at least one region of an upper or lower part of the thin film transistor to block the influence of light from the outside or generated in an organic film layer to the semiconductor layer, particularly a channel region of the thin film transistor.

CONFIGURATION OF THE INVENTION

The organic electroluminescence element and the manufacturing method thereof according to the present disclosure may include an insulation substrate, a lower light-blocking film formed on the substrate, a gate electrode/gate insulation layer formed on the light-blocking film, an amorphous silicon layer formed at an upper part of the gate insulation layer having high concentrated impurities doped into a certain region, a source/drain electrode formed on the region of the amorphous silicon layer with high concentrated impurities doped into, an insulation layer formed on the substrate and opened on a certain region of the source/drain electrode, a first electrode contacted to the source/drain electrode through the opened region of the insulation layer and formed on a pixel region, a light-blocking film formed at an upper part of the source/drain electrode, the amorphous silicon layer, and the insulation layer, and an organic film layer configured to be formed on the pixel region and include at least an organic light-emitting layer, and a second electrode, in which the light-blocking film and the lower light-blocking film are formed from one of metals among Ag, Cr, Pd, Mo, and MoW.

A manufacturing method of an organic electroluminescence element may include: preparing an insulation substrate, forming a lower light-blocking film on the substrate, forming a gate electrode on the lower light-blocking film, forming a gate insulating film and an amorphous silicon layer doped with high concentrated impurities to a certain thickness from an upper part thereof, on the substrate with the gate electrode formed thereon, forming a conductor layer on the amorphous silicon layer, patterning the conductor using a photoresist pattern to form a source/drain electrode, and etching from an upper part of the amorphous silicon layer to a certain thickness and width to form a source/drain electrode region and channel, forming an insulation layer on the substrate, forming a light-blocking film on the substrate by depositing and patterning a light-blocking film forming material, etching a certain region of the insulation layer to expose the source/drain electrode, and forming a first electrode contacted to the exposed source/drain electrode through the opened insulation layer, and an organic film layer including at least an organic light-emitting layer and a second electrode, in which forming the light-blocking film is depositing one of metals among Ag, Cr, Pd, Mo, and MoW on the substrate.

The present disclosure and methods of accomplishing the same may be understood more readily by reference to the following detailed description of the embodiments and the accompanying drawings.

FIGS. 2A to 2E are cross-sectional views showing a manufacturing process of an organic electroluminescence element according to an exemplary embodiment of the present disclosure.

First, FIG. 2A is a cross-sectional view showing a process of forming a gate electrode on an insulation substrate, a first electrode of a capacitor, and a semiconductor layer. As shown in the drawing, a buffer layer (102) is formed on a transparent insulation substrate (101) such as plastic or glass to protect an element thereon and the substrate thereunder. Then a material forming the gate electrode and the first electrode of the capacitor is formed and patterned on the entire surface of the substrate to form a gate electrode (103) of a thin film transistor and a first electrode (104) of the capacitor.

At this time, metals with low resistance such aluminum (Al) are used as the gate electrode and the first electrode forming material of the capacitor to reduce signal delay. However, the aluminum has low chemical resistance, and a hillock occurs at 200°C or above which a certain region grows to several micrometers. Therefore, a laminated structure of aluminum and aluminum oxide (Al_2O_3), a laminated structure of a metal film such as MoW, or an aluminum alloy such as Al-Nd is also used.

An insulation layer (105) made of a single film or multiple films of silicon oxide or silicon nitride is formed on the entire surface of the substrate, which functions as a gate insulation layer in the thin film transistor region and as a dielectric layer of the capacitor in the capacitor region. Particularly, it is preferable that the gate insulation layer is formed using plasma enhanced chemical vapor deposition (PECVD), which allows consecutively forming the gate insulation layer and the amorphous silicon layer to form a thin film transistor with good interface properties of the gate insulation layer and the amorphous silicon layer.

Next, a semiconductor layer is formed by depositing amorphous silicon on the entire surface of the substrate using chemical vapor deposition or physical vapor deposition, forming a region with high concentrated impurities to a certain depth with ion implantation, and then patterning. Or, it is formed by consecutively forming an amorphous silicon layer without impurities doped into and an amorphous silicon layer doped with high concentrated impurities using chemical vapor deposition, and then patterning. The chemical vapor deposition may form an amorphous silicon layer without impurities doped into using a mixture of SiH_4 gas and H_2 gas, and may form an amorphous silicon layer doped with high concentrated impurities using SiH_4 gas, PH_3 gas, and H_2 gas.

Accordingly, the semiconductor layer (106) is formed of an amorphous silicon layer doped with high concentrated impurities to a certain depth (n_+-Si) (106a) and an amorphous silicon layer without high concentrated impurities doped into (a-Si)(106b) thereunder.

FIG. 2B is a cross-sectional view showing a process of forming a source/drain electrode of the thin film transistor and a second electrode of the capacitor on the substrate, and etching a part of the semiconductor layer to define a source/drain region and a channel region. As shown in the drawing, a material forming the source/drain electrode of the thin film transistor and the second electrode of the capacitor is formed and patterned on the entire surface of the substrate to form a source/drain electrode (107) and a second electrode (108) of the capacitor. Then, a part of the semiconductor layer exposed when forming the source/drain electrode (a region with high concentrated impurities doped into) is etched to define the channel region and the source/drain region.

A material forming the source/drain electrode and the second electrode of the capacitor is a metal such as aluminum, aluminum alloy, chromium (Cr), or titanium (Ti) that does not form a Schottky barrier between the amorphous silicon layer doped with high concentrated impurities and the source/drain electrode, and is deposited using a sputtering method.

The source/drain electrode and the second electrode may be formed by etching the material forming the source/drain electrode and the second electrode of the capacitor using a photoresist pattern. The amorphous silicon layer doped with high concentrated impurities (106a) exposed by etching the source/drain electrode in the middle region of the source/drain region is etched, thereby defining the lower amorphous silicon layer as the channel region and defining the amorphous silicon layer doped with high concentrated impurities as the source/drain region. At this time, amorphous silicon layer is formed by end-point detection (EPD) etching in which etching stops when the lower amorphous silicon layer without impurities doped into is exposed.

Next, FIG. 2C is a cross-sectional view showing a process of forming an inter insulation layer on the entire surface of the substrate, forming a light-blocking film at the upper part of the thin film transistor, and forming a first electrode contacted to a source/drain electrode in a pixel region. As shown in the drawing, an inter insulation layer (109) is formed using an oxide film or an insulation film on the entire surface of the substrate to protect the elements thereon or thereunder. A material forming a light-blocking film is deposited to prevent externally irradiated light or light emitted from an internal element such as an organic luminescence layer from entering the semiconductor layer of the thin film transistor through scattering or diffuse reflection and causing a negative effect, and then a light-blocking film (110) is formed at the upper part of the thin film transistor by patterning.

The light-blocking film is formed, as shown in region A of the drawing, using a material with excellent step coverage following the morphology of the source/drain electrode and the insulation layer, so that light is not scattered or reflected and does not enter the channel region of the semiconductor layer.

Also, the material forming the light-blocking film is one or more of metals such as AlNd, Ag, Cr, Pd, ACX, Al, Mo, and MoW.

FIG. 2D is a cross-sectional view showing a process of opening a certain region of the inter insulation layer, and depositing and patterning a material forming a first electrode to form the first electrode which is a transparent electrode. As shown in the drawing, a certain region of the inter insulation layer is opened to expose the surface of the source/drain electrode, and then a substrate forming the first electrode is deposited on the entire surface of the substrate to electrically contact with the source/drain electrode.

Next, the first electrode which is a transparent electrode is formed by patterning the material forming the first electrode.

FIG. 2E is a cross-sectional view of a process forming a planarization layer on the substrate, opening a part of the planarization layer to expose a first electrode and define a pixel region, and forming an organic film layer including at least an organic luminescence layer and a second electrode. As shown in the drawing, the planarization layer is formed on the entire surface of the substrate to alleviate the steps caused by the elements thereunder. Although either an organic or inorganic material may be used to form the planarization layer, it is preferable to form the planarization layer as an organic film because of a simple process such as spin coating.

A part of the planarization layer, i.e., a pixel region may be opened (etched) to expose the surface of the first electrode, and then an organic film layer (113) including at least an organic luminescence layer and a second electrode (114) which is a common electrode on the substrate, thereby forming the organic electroluminescence element.

The second electrode is formed of a metal such as aluminum or molybdenum that has excellent light reflection and low resistance to form a bottom-emission organic electroluminescence element.

FIGS. 3A and 3B are cross-sectional views showing an organic electroluminescence element manufactured by another exemplary embodiment of the present disclosure.

FIGS. 3A is a cross-sectional view showing an organic electroluminescence element manufactured by another exemplary embodiment of the present disclosure. As shown in the drawing, a material forming a light-blocking film is deposited on a buffer layer (202) under a thin film transistor to be formed on a transparent insulation substrate (201) such as plastic or glass, and patterned to form a light-blocking film (203), and then a light-blocking film (204) for insulating the lower light-blocking film is formed on the entire surface of the substrate.

A gate electrode (205), a first electrode (206) of a capacitor, an insulation layer (207) that functions as a dielectric film of a gate insulation layer and a capacitor, a semiconductor layer (208), a source/drain electrode (209), a second electrode (210) of a capacitor, and an inter insulation layer (211) are formed to form a thin film transistor and a capacitor. An upper light-blocking film (212) that blocks the semiconductor layer of the thin film transistor from light is formed on the upper part of the inter insulation layer. A first electrode (213) that is a transparent electrode and a planarization layer (214) are formed, and then an organic film layer (215) including at least an organic light-emitting layer and a second electrode (216) are formed to manufacture a bottom-emission organic electroluminescence element.

Also, the material forming the light-blocking film is one or more of metals such as AlNd, Ag, Cr, Pd, ACX, Al, Mo, and MoW.

As described above, a bottom-emission organic electroluminescence element having a light-blocking film formed on at least one of the upper and lower parts thereof may not only block scattered or diffusely reflected light entering a semiconductor layer of a thin film transistor, but also completely block light entering from the outside through an insulation substrate by exposing the insulation substrate to the external environment. In this way, light can be blocked more efficiently than when light is blocked with a gate electrode according to the related art, and the manufacturing method is also simple.

FIGS. 3B is a cross-sectional view showing an organic electroluminescence element manufactured by another exemplary embodiment of the present disclosure. As shown in the drawing, a material forming a light-blocking film is deposited on a buffer layer (202) under a thin film transistor to be formed on a transparent insulation substrate (201) such as plastic or glass, and patterned to form a light-blocking film (203), and then a light-blocking film (204) for insulating the lower light-blocking film is formed on the entire surface of the substrate.

A gate electrode (205), a first electrode (206) of a capacitor, an insulation layer (207) that functions as a dielectric film of a gate insulation layer and a capacitor, a semiconductor layer (208), a source/drain electrode (209), a second electrode (210) of a capacitor, and an inter insulation layer (211) are formed to form a thin film transistor and a capacitor. An upper light-blocking film (212) that blocks the semiconductor layer of the thin film transistor from light is formed on the upper part of the inter insulation layer. A first electrode (213) that is a transparent electrode and a planarization layer (214) are formed, a pixl defined layer (217) that defines a pixel region is formed, and then an organic film layer (215) including at least an organic light-emitting layer and a second electrode (216) are formed to manufacture a bottom-emission organic electroluminescence element.

At this time, a reflection film (not shown) is further formed of a metal such as aluminum before forming the first electrode, and the second electrode is formed as a transparent electrode using a transparent metal such as silver (Ag), calcium (Ca), or MgAg.

A top-emission organic electroluminescence element having a light-blocking film formed on at least one of an upper and lower parts thereof completely blocks light from entering the semiconductor layer, particularly, a channel region of the semiconductor layer, by forming the light-blocking film that prevents light from entering from the upper and lower parts of the semiconductor layer of the thin film transistor. As a result, a bottom-gate thin film transistor including a semiconductor layer formed of an amorphous silicon layer that is sensitive to light may be used in an organic light-emitting element.

While the invention has been described in connection with what is presently considered to be practical exemplary embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and arrangements within the spirit and scope of the invention by those skilled in the art.

EFFECT

Accordingly, the organic electroluminescence element and the manufacturing method thereof according to the present disclosure, when forming an organic electroluminescence element including a bottom-gate thin film transistor in which a semiconductor layer is formed of an amorphous silicon, a light-blocking film may be formed on at least one of the upper and lower parts of the thin film transistor, and a light-blocking film may be formed on the semiconductor layer of the thin film transistor, particularly, on the channel region of the semiconductor layer to block light emitted from the outside or inside, thereby providing not only excellent thin film transistor properties, but also a simple process in which the semiconductor layer is formed by using amorphous silicon.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1A to 1D are cross-sectional views showing a manufacturing process of an organic electroluminescence element that includes a thin film transistor with a conventional bottom-gate structure.

FIGS. 2A to 2E are cross-sectional views showing a manufacturing process of an organic electroluminescence element according to an exemplary embodiment of the present disclosure.

FIGS. 3A and 3B are cross-sectional views showing an organic electroluminescence element manufactured by another exemplary embodiment of the present disclosure.

<MAIN NUMERALS IN THE DRAWINGS>

110, 212: Light-blocking film 111, 213: First electrode

113, 215: Organic film layer 114, 216: Second electrode

DRAWINGS

FIG. 1A

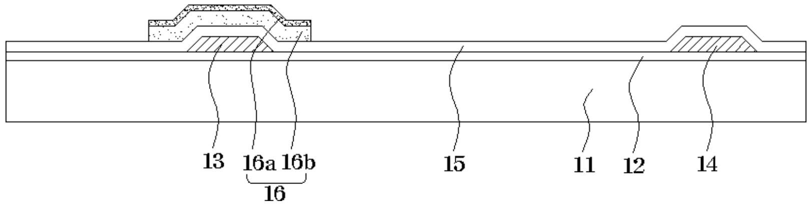

FIG. 1B

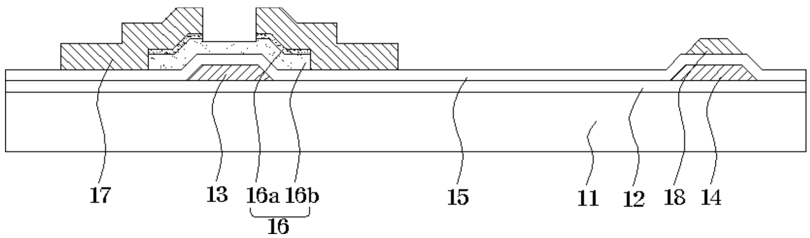

FIG. 1C

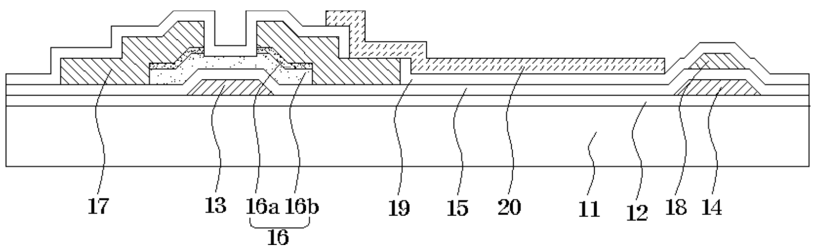

FIG. 1D

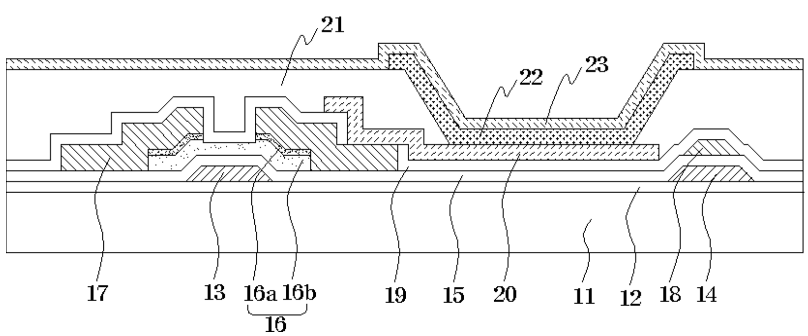

FIG. 2A

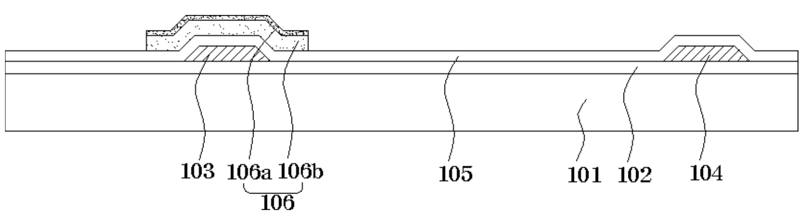

FIG. 2B

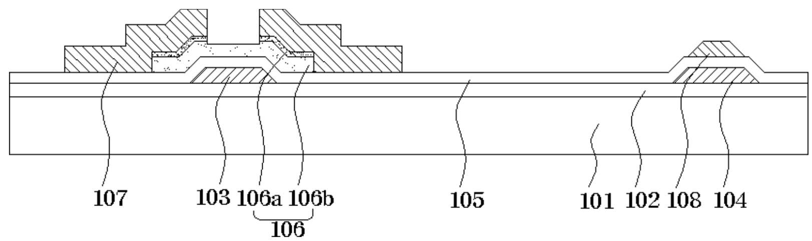

FIG. 2C

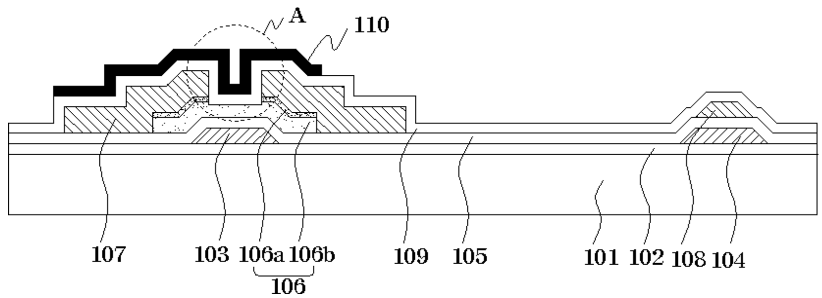

FIG. 2D

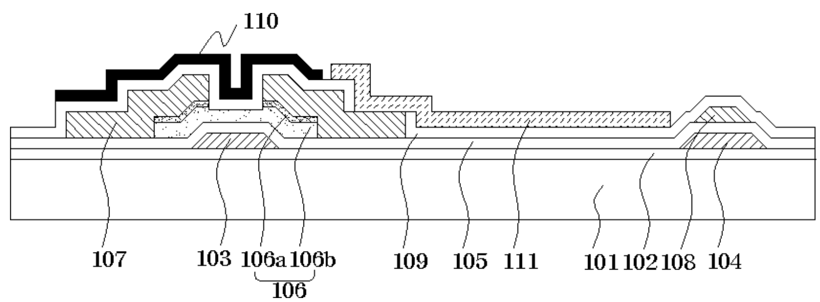

FIG. 2E

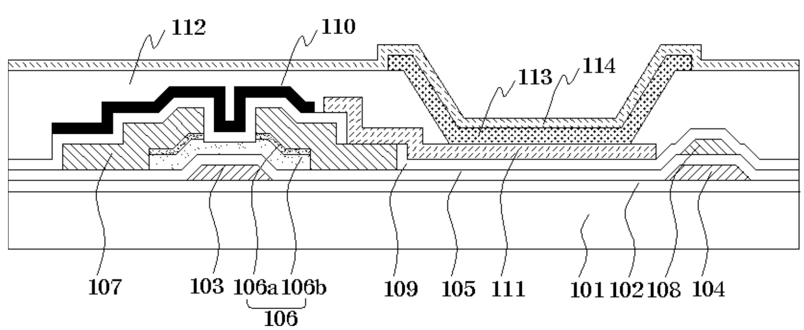

FIG. 3A

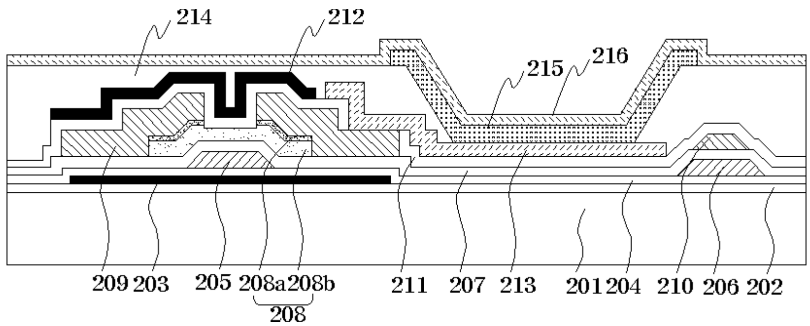
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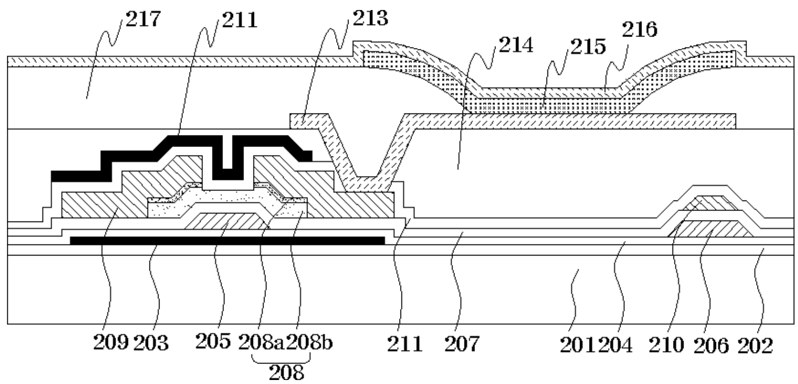
FIG. 3B


217
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MORNINGSIDE
A Questel Company

TRANSLATION CERTIFICATION

Date: December 9, 2024

To whom it may concern:

I, Yeonji S., a translator fluent in the Korean and English languages, on behalf of Morningside, do solemnly and sincerely declare that the following is, to the best of my knowledge and belief, a true and correct translation of the document listed below in a form that best reflects the intention and meaning of the original text.

The document is designated as:

- KR100659756B1

Yeonji S.

Signature

Yeonji S.

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