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(54) ORGANIC LIGHT-EMITTING DISPLAY DEVICE AND METHOD FOR MANUFACTURING SAME

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H01L 21/02	(2006.01)
H01L 27/32	(2006.01)
H01L 51/10	(2006.01)

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

CPC ***H01L 51/5203*** (2013.01); ***G09G 3/3233*** (2013.01); ***H01L 21/0217*** (2013.01); ***H01L 27/3276*** (2013.01); ***H01L 51/107*** (2013.01); ***H01L 51/5253*** (2013.01); *G09G 2310/0264* (2013.01)

(58) **Field of Classification Search**

CPC .. H01M 2/166; H01M 2/1686; H01M 2/1653; H01L 51/5253; H01L 27/3244; H01L 51/5203; H01L 21/0217; H01L 51/5012; G09G 3/3233; G09G 3/22; G09G 2300/08; G09G 2320/045

See application file for complete search history.

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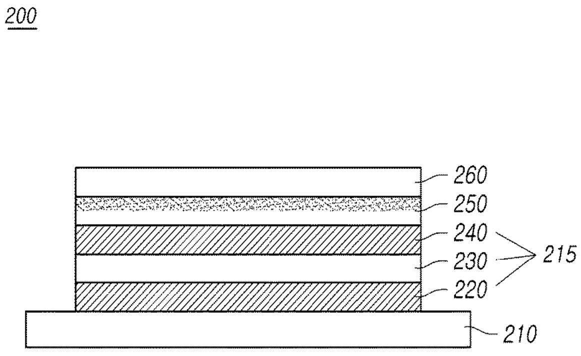
(57) ABSTRACT

The present disclosure provides an organic light-emitting display device including: a substrate; a first electrode configured to be disposed on the substrate; an organic layer configured to be disposed on the first electrode; a second electrode configured to be disposed on the organic layer; an anti-peeling layer configured to be disposed on the second electrode and to include an inorganic material; and a protective layer configured to be disposed on the anti-peeling layer and to include a metal oxide, and a method for manufacturing the organic light-emitting display device.

14 Claims, 14 Drawing Sheets



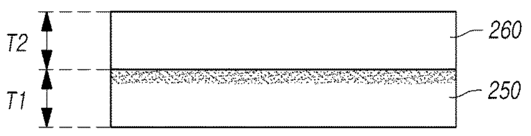


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FIG. 1

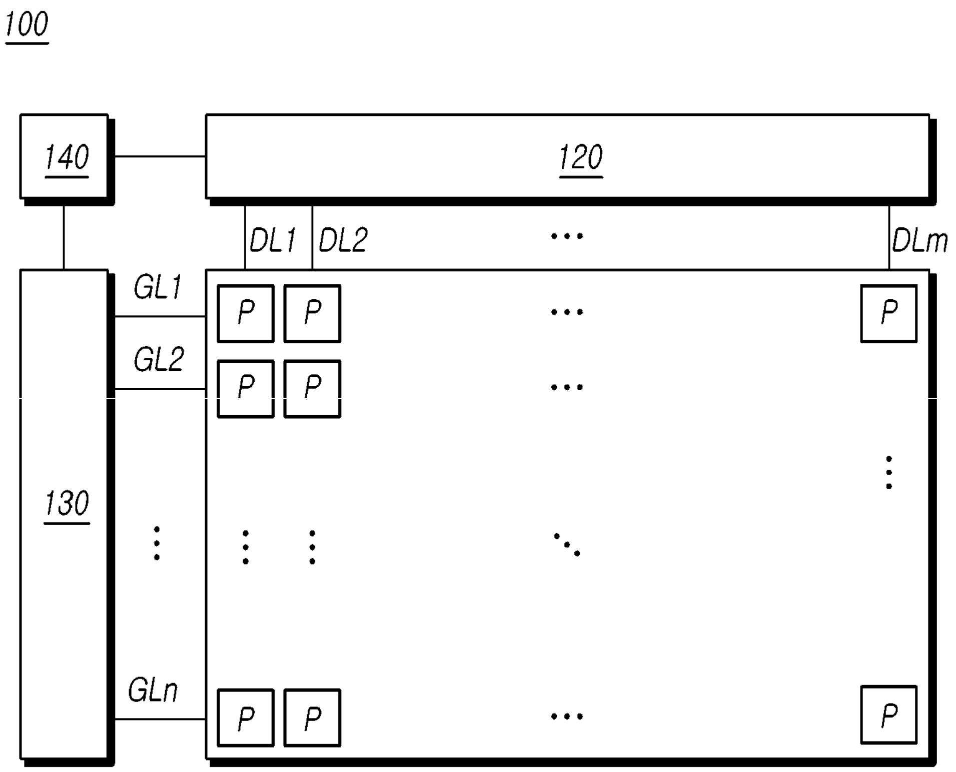


FIG.2

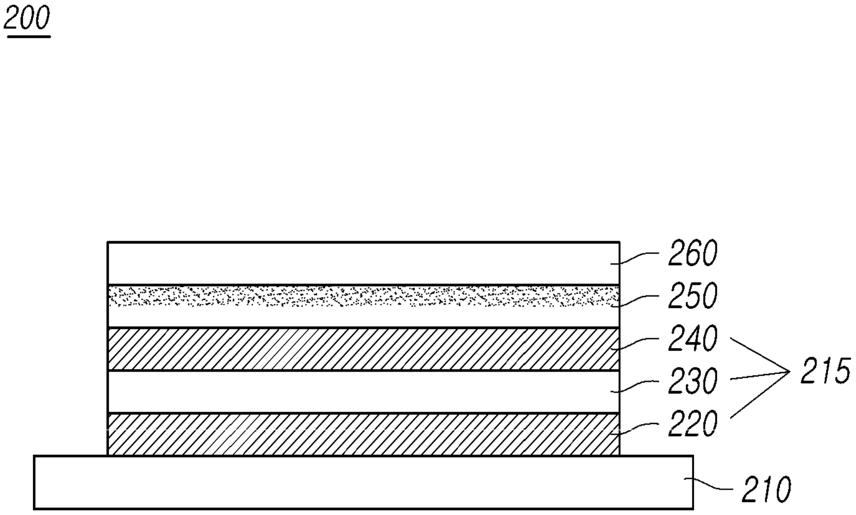


FIG.3

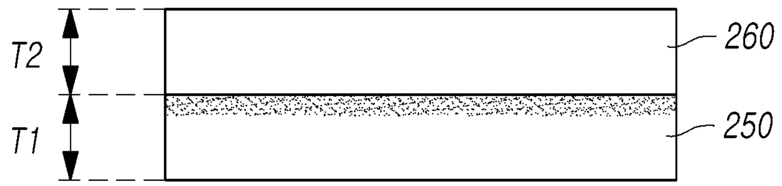


FIG.4A

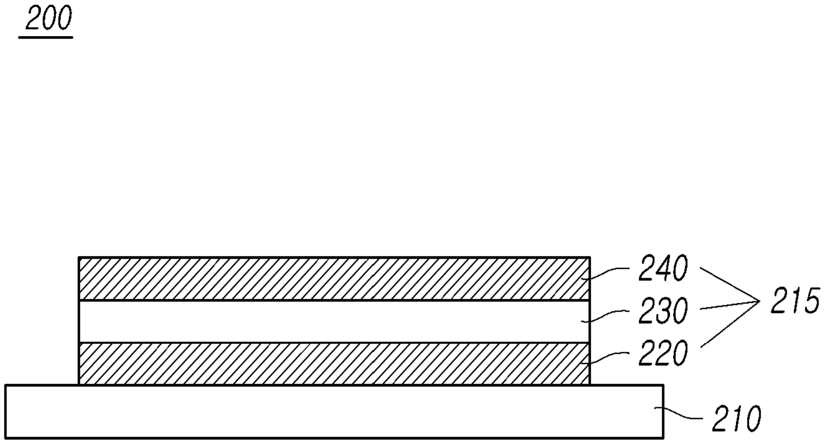


FIG.4B

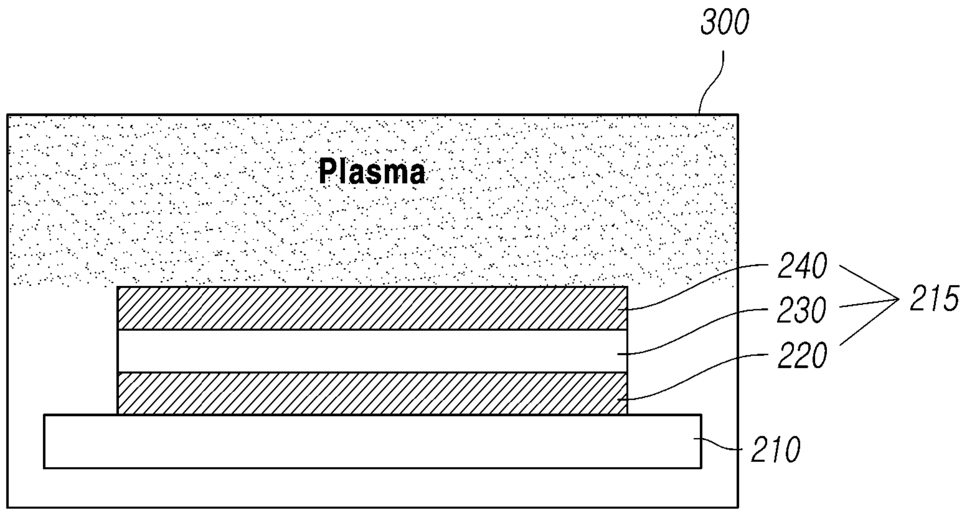


FIG.4C

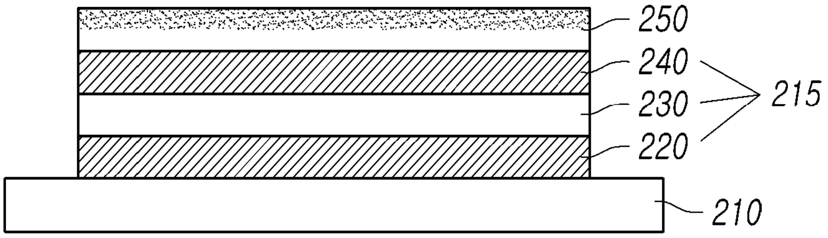


FIG.4D

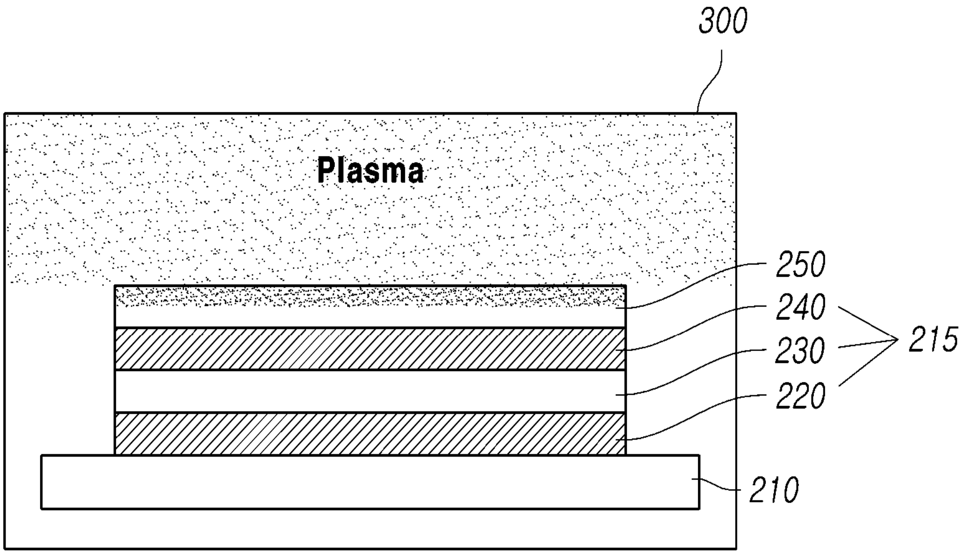


FIG.4E

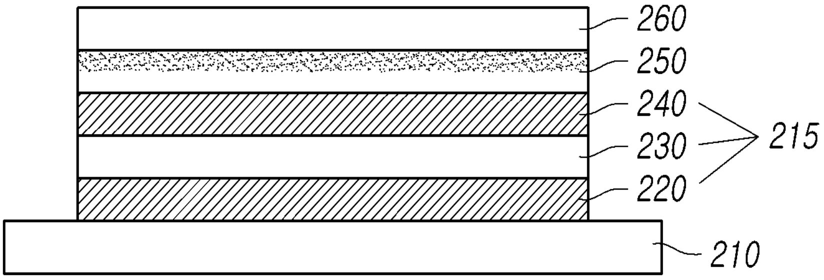


FIG.5

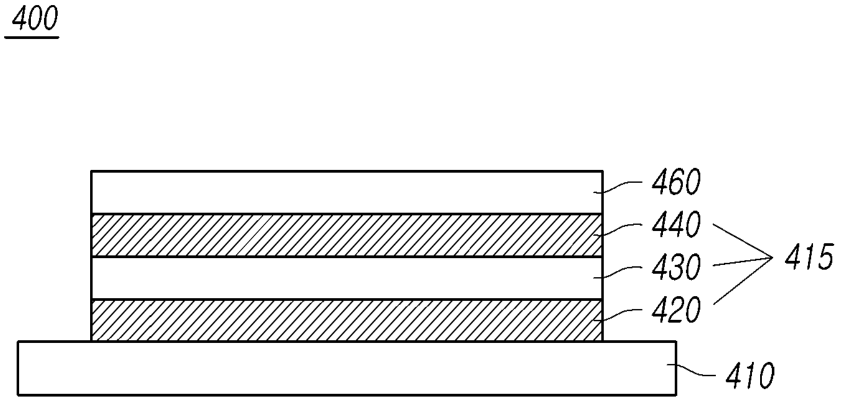


FIG.6A

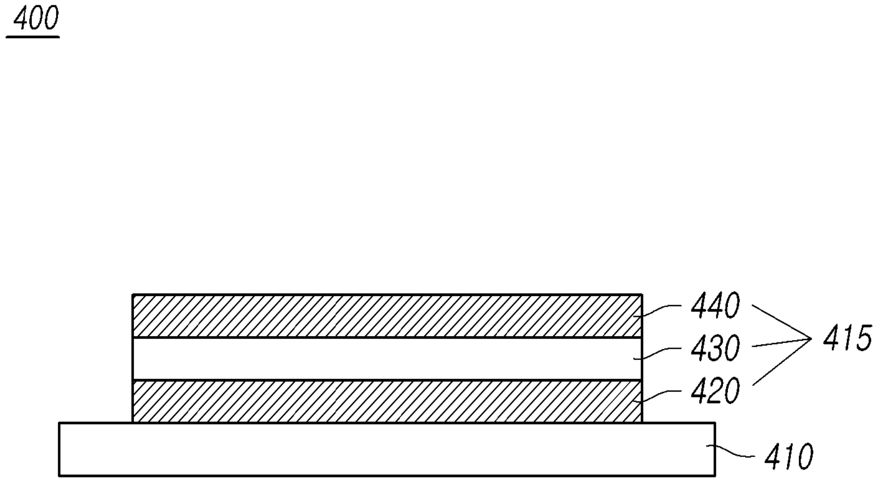


FIG. 6B

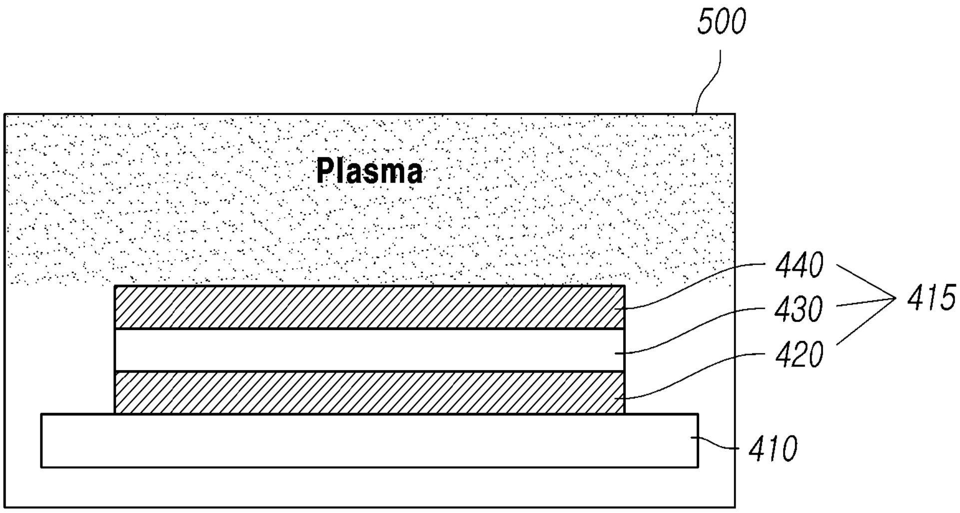


FIG.6C

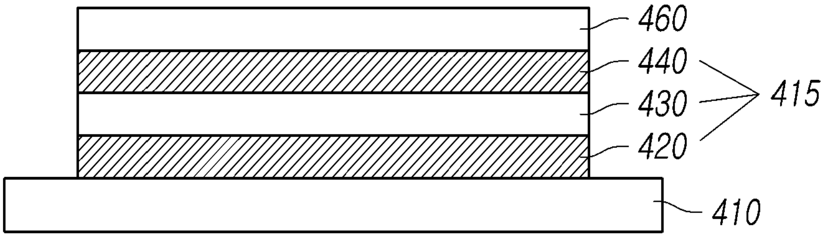


FIG. 7

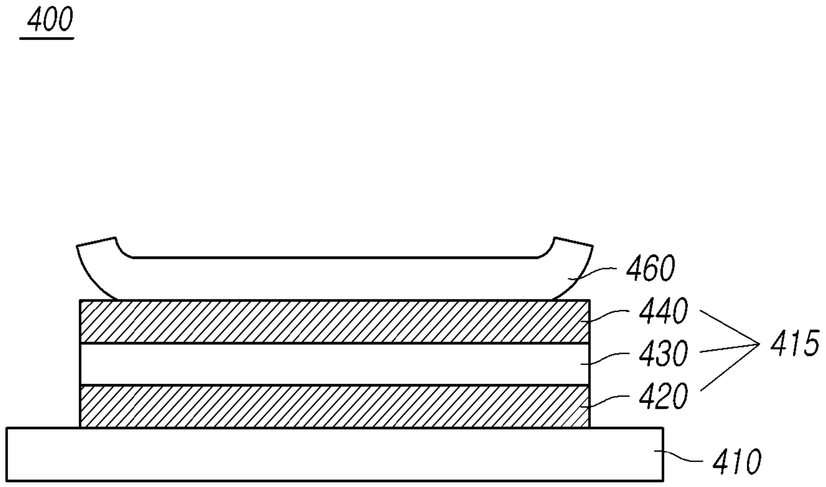
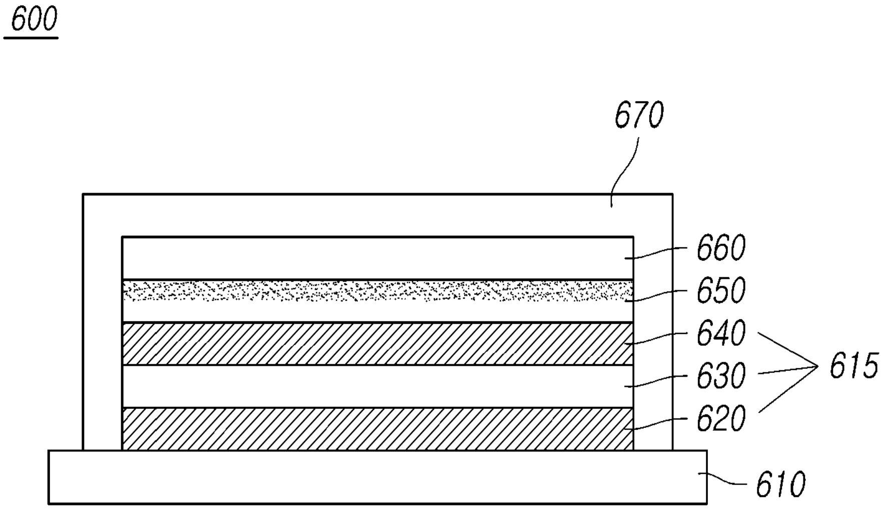


FIG.8



ORGANIC LIGHT-EMITTING DISPLAY DEVICE AND METHOD FOR MANUFACTURING SAME

CROSS REFERENCE TO RELATED APPLICATION

This application claims priority from Korean Patent Application No. 10-2016-0143609, filed Oct. 31, 2016, which is hereby incorporated by reference for all purposes as if fully set forth herein.

BACKGROUND

Technical Field

The present disclosure relates to an organic light-emitting display device for displaying an image and a method for manufacturing the same.

Description of the Prior Art

In recent years, an organic light-emitting display device, which has received great attention as a (next-generation) display device, has advantages of a high response speed, high light emission efficiency, high luminance, a wide viewing angle, and the like owing to the use of an Organic Light-Emitting Diode (OLED).

The OLED is very vulnerable to external gases such as oxygen and moisture. Accordingly, a protective layer for protecting the OLED is disposed to prevent the penetration of oxygen or moisture from the outside.

However, the material of the protective layer and the manufacturing process thereof greatly affect the quality of a product. It is necessary that the material of the protective layer and the manufacturing process thereof do not affect or decrease the quality of the product.

BRIEF SUMMARY

Against this background, an aspect of the present disclosure is to provide an organic light-emitting display device, which can prevent an Organic Light-Emitting Diode (OLED) from being damaged or prevent a protective layer or a second electrode from peeling off, regardless of the material of the protective layer and the manufacturing process thereof, thereby significantly improving the quality of the product.

In accordance with an aspect of the present disclosure, there is provided an organic light-emitting display device including: a substrate; a first electrode configured to be disposed on the substrate; an organic layer configured to be disposed on the first electrode; a second electrode configured to be disposed on the organic layer; an anti-peeling layer configured to be disposed on the second electrode and to include an inorganic material; and a protective layer configured to be disposed on the anti-peeling layer and to include a metal oxide.

In accordance with another aspect of the present disclosure, there is provided a method for manufacturing an organic light-emitting display device, including: forming a first electrode on a substrate; forming an organic layer on the first electrode; forming a second electrode on the organic layer; forming an anti-peeling layer with an inorganic film on the second electrode; and forming a protective layer with a metal oxide film on the anti-peeling layer.

As described above, according to the present disclosure, an organic light-emitting display device can prevent an OLED from being damaged or prevent a protective layer or a second electrode from peeling off, regardless of the material of the protective layer and the manufacturing process, thereby significantly improving the quality of the product.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The above and other objects, features and advantages of the present disclosure will be more apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a schematic system configuration diagram of an organic light-emitting display device to which embodiments are applied;

FIG. **2** is a cross-sectional diagram of an organic light-emitting display device according to an embodiment of the present disclosure;

FIG. **3** is an enlarged view of an anti-peeling layer and a protective layer of FIG. **2**;

FIGS. **4**A to **4**E are process diagrams of a method for manufacturing an organic light-emitting display device according to another embodiment;

FIG. **5** is a cross-sectional view of an organic light-emitting display device according to a comparative example;

FIGS. **6**A to **6**C are process diagrams of a method for manufacturing an organic light-emitting display device according to a comparative example;

FIG. **7** illustrates a phenomenon in which a side surface of a protective layer is peeled off in an organic light-emitting display device according to a comparative example; and

FIG. **8** is a cross-sectional view of an organic light-emitting display device according to still another embodiment.

DETAILED DESCRIPTION

Hereinafter, some embodiments of the present disclosure will be described in detail with reference to the accompanying illustrative drawings. In designating elements of the drawings by reference numerals, the same elements will be designated by the same reference numerals although they are shown in different drawings. Further, in the following description of the present disclosure, a detailed description of known functions and configurations incorporated herein will be omitted when it may make the subject matter of the present disclosure rather unclear.

In addition, terms, such as first, second, A, B, (a), (b) or the like may be used herein when describing components of the present disclosure. Each of these terminologies is not used to define an essence, order or sequence of a corresponding component but used merely to distinguish the corresponding component from other component(s). In the case that it is described that a certain structural element “is connected to,” “is coupled to,” or “is in contact with” another structural element, it should be interpreted that another structural element may “be connected to,” “be coupled to,” or “be in contact with” the structural elements as well as that the certain structural element is directly connected to or is in direct contact with another structural element.

FIG. **1** is a schematic system configuration diagram of an organic light-emitting display device to which embodiments are applied.

Referring to FIG. **1**, an organic light-emitting display device **100** to which embodiments are applied includes a display panel **110**, a data-driving unit **120**, a gate-driving unit **130**, a controller **140**, and the like.

In the display panel **110**, m data lines DL**1** to DLm are arranged in a first direction and n gate lines GL**1** to GLn are arranged in a second direction, which is different from the first direction, and a plurality of pixels P arranged in a pixel region where the formed m data lines DL**1** to DLm and n gate lines GL**1** to GLn cross each other is defined.

The data-driving unit **120** supplies a data voltage to the m data lines DL**1** to DLm.

The gate-driving unit **130** sequentially supplies a scan signal to the n gate lines GL**1** to GLn.

An Organic Light-Emitting Diode (OLED), a transistor, a capacitor, or the like may be formed in each pixel region of the display panel **110**.

For example, in each pixel region, an OLED including a first electrode, an organic layer, and a second electrode, a driving transistor for supplying a current to the first electrode (e.g., an anode or a cathode) of the OLED, a storage capacitor for maintaining a data voltage transmitted to a gate node of the driving transistor for an amount of time corresponding to one frame, and the like are basically arranged.

The current is supplied to the first electrode of the OLED formed in each of the above-described pixel regions to emit light of a corresponding color in the organic layer. However, the OLED is very vulnerable to external gases such as oxygen and moisture. Accordingly, a protective layer for protecting the OLED is disposed to prevent the penetration of oxygen or moisture from outside.

However, depending on the material of the protective layer and the manufacturing process thereof, the OLED may be damaged, or the protective layer or the second electrode may be peeled, which may significantly degrade the quality of a product.

Hereinafter, an organic light-emitting display device according to embodiments and a method for manufacturing the same will be described in detail with reference to the drawings.

FIG. **2** is a cross-sectional diagram of an organic light-emitting display device according to an embodiment of the present disclosure.

Referring to FIG. **2**, an organic light-emitting display device **200** according to an embodiment may include a first electrode **220** disposed on a substrate **210**, an organic layer **230** disposed on the first electrode **220**, a second electrode **240** disposed on the organic layer **230**, an anti-peeling layer **250** disposed on the second electrode **240**, and a protective layer **260** disposed on the anti-peeling layer **250**.

The organic light-emitting display device **200** according to an embodiment may be a bottom organic light-emitting display device that emits light in the direction of the substrate **210** or a top organic light-emitting display device that emits light in the direction opposite the substrate **210**, that is, in the direction of the protective layer **260**.

The first electrode **220** may be a transparent electrode or a metal electrode. When the first electrode **220** is the transparent electrode, the first electrode **220** may be made of a metal oxide such as ITO, TO, IZO, ZnO, ITZO, or In_2O_3. When the first electrode **220** is the metal electrode, the first electrode **220** may be made of a metal such as Ag, Mg, Al, Pt, Pd, Au, Ni, Nd, Ir, Cr, or an alloy thereof.

A light-emitting layer is provided in the organic layer **230** between the first electrode **220** and the second electrode **240**. The light-emitting layer may include a red light-emitting layer, a green light-emitting layer, and a blue light-emitting layer, or may include a white light-emitting layer. In addition, the light-emitting layer may separately include red, green, and blue color filters.

At least one or more of a hole injection layer, a hole transport layer, an electron transport layer, an electron injection layer, and a capping layer, in addition to the light-emitting layer, may be further provided in the organic layer **230**. The organic layer **230** may be made of a low-molecular organic material or a high-molecular organic material.

The second electrode **240** may also be a transparent electrode or a metal electrode. When the second electrode **240** is a transparent electrode, the second electrode **240** may be made of a metal oxide such as ITO, TO, IZO, ZnO, ITZO, or In_2O_3. When the second electrode **240** is a metal electrode, the second electrode **240** may be made of a metal such as Ag, Mg, Al, Pt, Pd, Au, Ni, Nd, Ir, Cr, or an alloy thereof. Hereinafter, the second electrode **240** is described as a metal electrode that is made of metal, but is not limited thereto.

The anti-peeling layer **250** may surround a side surface of an OLED **215** positioned on the substrate **210** together with an upper surface of the second electrode **240**.

The anti-peeling layer **250** disposed on the second electrode **240** of the OLED **215** prevents the protective layer **260** or the second electrode from being peeled off by the process of manufacturing the protective layer **260**, or prevents a dark spot from being generated when the device is turned on, thereby protecting the OLED **215**. As will be described later, the anti-peeling layer **250**, which is not affected by an oxygen (O_2) gas that is used during the manufacturing process of the protective layer **260**, is disposed below the protective layer **260** between the second electrode **240** and the protective layer **260**, thereby protecting the OLED **215** and preventing the protective layer **260** or the second electrode from peeling off.

In terms of materials, the anti-peeling layer **250** may contain an inorganic material. The inorganic material contained in the anti-peeling layer **250** may be an inorganic material that does not contain oxygen. At this time, the anti-peeling layer **250** may be made of an inorganic material that does not contain oxygen using Plasma Enhanced Chemical Vapor Deposition (PECVD). The anti-peeling layer **250** may be made of an inorganic material that does not contain oxygen, for example, a material selected from silicon nitride, aluminum nitride, zirconium nitride, titanium nitride, hafnium nitride, and the like, but the material of the anti-peeling layer **250** is not necessarily limited to the above examples. Specifically, the inorganic material that does not contain oxygen may be SiNy (where y is a real number larger than 1).

When the second electrode **240** is a metal electrode, an inorganic material contained in the anti-peeling layer **250** disposed on the second electrode **240** may be a metal nitride for a metal contained in the second electrode **240**. For example, when the second electrode **240** is aluminum, the anti-peeling layer **250** may be made of aluminum nitride. When the metal nitride for the metal contained in the second electrode **240** is formed on the second electrode **240** through a nitrogen (N_2) plasma treatment, it is possible to prevent the OLED **215** from being damaged without separate additional equipment.

The protective layer **260** is disposed to protect the OLED **215**. The protective layer **260** may surround the side surfaces of the OLED **215** and the anti-peeling layer **250**, which are positioned above the substrate **210** together with the upper surface of the anti-peeling layer **250**.

The protective layer **260** may prevent the penetration of oxygen or moisture into the OLED **215**. The protective layer **260** disposed on the anti-peeling layer **250** may contain a metal oxide.

The protective layer **260** may be made of a metal oxide, for example, a material selected from calcium oxide, alumina, silica, titania, indium oxide, tin oxide, and silicon oxide, but the material of the protective layer **260** is not necessarily limited to the above examples.

Specifically, the metal oxide may be a silicon oxide (SiOx) (where x is a real number larger than 1). When the protective layer **260** contains a silicon oxide as described below, the protective layer **260** may be made of a silicon oxide (SiOx) using hexamethyldisiloxane (HMDSO), represented by Chemical Formula 1, and oxygen in a plasma atmosphere.

[Chemical Formula 1]

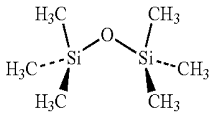


FIG. **3** is an enlarged view of the anti-peeling layer **250** and the protective layer **260** of FIG. **2**.

Referring to FIG. **3**, the thickness T**1** of the anti-peeling layer **250** and the thickness T**2** of the protective layer **260** may be different from each other. For example, the thickness T**2** of the protective layer **260** may be greater than the thickness T**1** of the anti-peeling layer **250**. As an example, the thickness T**1** of the anti-peeling layer **250** may range from 0.1 um to 0.5 um, but is not limited thereto.

As will be described later, in a step of forming the protective layer **260**, when the protective layer **260** is made of the silicon oxide (SiOx) (where x is a real number larger than 1) using hexamethyldisiloxane and oxygen (O_2) through PECVD, the molecular structure, physicochemical properties, and film quality of the silicon oxide (SiOx) (where x is a real number larger than 1) are different from those of the silicon oxide (SiOx) (where x is a real number larger than 1) generally using SiH_4 and oxygen (O_2). In addition, when the protective layer **260** is made of silicon oxide (SiOx), hydrogen does not remain during the formation of the protective layer **260**, thereby preventing such residual hydrogen from causing highly luminescent spot defects.

FIGS. **4**A to **4**E are process diagrams of a method for manufacturing an organic light-emitting display device according to another embodiment.

Referring to FIG. **4**A, a method for manufacturing an organic light-emitting display device according to another embodiment includes forming the OLED **215** on the substrate **210**.

In the forming the OLED **215** on the substrate **210**, the OLED **215** including the first electrode **220**, the second electrode **240** corresponding to the first electrode **220**, and the organic layer **230** disposed between the first electrode **220** and the second electrode **240** may be formed on one surface of the substrate **210** for each unit pixel.

Referring to FIGS. **4**B and **4**C, the method for manufacturing the organic light-emitting display device according to another embodiment includes forming the anti-peeling layer **250** on the OLED **215**. The substrate **210**, with the various layers thereon maybe placed in a manufacturing apparatus **300** a various times during the manufacturing process.

In the formation of the anti-peeling layer **250** on the second electrode **240** of the OLED **215**, the anti-peeling layer **250** may be made of an inorganic material that does not contain oxygen, for example, a material selected from silicon nitride, aluminum nitride, zirconium nitride, titanium nitride, hafnium nitride, and the like. Specifically, the inorganic material that does not contain oxygen may be SiNy (where y is a real number larger than 1).

In the formation of the anti-peeling layer **250** on the second electrode **240**, in the case in which the second electrode **240** is made of a metal, when the metal contained in the second electrode **240** is metal nitride, for example, aluminum, the anti-peeling layer **250** may be made of aluminum nitride.

In the formation of the anti-peeling layer **250** on the second electrode **240**, in the case in which the second electrode **240** is made of a metal, when the metal nitride for the metal contained in the second electrode **240** is formed on the second electrode **240** through a nitrogen (N_2) plasma treatment, it is possible to form chemically stable metal nitride and to form the anti-peeling layer **250** without separate additional equipment. For example, the anti-peeling layer **250** made of the metal nitride may be formed by the second electrode **240** through nitrogen (N_2) plasma treatment on aluminum (Al).

Referring to FIGS. **4**D and **4**E, the method for manufacturing the organic light-emitting display device according to another embodiment includes forming the protective layer **260** with a metal oxide film on the anti-peeling layer **250**.

In the formation of the protective layer **260**, the protective layer **270** may be made of a metal oxide, for example, a material selected from calcium oxide, alumina, silica, titania, indium oxide, tin oxide, and silicon oxide. Specifically, the metal oxide may be a silicon oxide (SiOx) (where x is a real number larger than 1). When the protective layer **260** contains a silicon oxide, the protective layer **260** may be made of a silicon oxide (SiOx) using hexamethyldisiloxane (HMDSO) and oxygen in a plasma atmosphere. When the protective layer **260** is made of the silicon oxide (SiOx), hydrogen does not remain during the formation of the protective layer **260**, thereby preventing such residual hydrogen from causing highly luminescent spot defects.

In order to form the protective layer **260** using the silicon oxide (SiOx) through Metalorganic Chemical Vapor Deposition (MOCVD), an oxygen (O_2) gas in a plasma state which reacts with hexamethyldisiloxane in the manufacturing apparatus **300** is used. However, when the specific gravity of the oxygen (O_2) gas is low, it is difficult to prevent moisture permeation due to poor metal oxide film quality, and when the specific gravity of the oxygen (O_2) gas is high, the protective layer **260** or the second electrode may be peeled off, or a dark spot may be generated when the device is turned on.

However, the anti-peeling layer **250** which is not affected by the oxygen (O_2) gas is formed below the protective layer **260** between the second electrode **240** and the protective layer **260** using MOCVD, thereby protecting the OLED **215** and preventing the protective layer **260** or the second electrode from peeling off, regardless of the material of the protective layer and the manufacturing process thereof.

FIG. **5** is a cross-sectional view of an organic light-emitting display device according to a comparative example.

Referring to FIG. **5**, an organic light-emitting display device **400** according to an embodiment includes an OLED **415** disposed on a substrate **410** and a protective layer **460** disposed on the OLED **415**.

The OLED **415** formed on one surface of the substrate **410** for each unit pixel may include a first electrode **420** that is formed on an active region for each unit pixel and is supplied with a current from a corresponding driving transistor, a second electrode **440** corresponding to the first electrode **420**, and an organic layer **430** disposed between the first electrode **420** and the second electrode **440**.

The protective layer **460** containing a metal oxide is disposed to protect the OLED **415**. The protective layer **460** is made of a metal oxide, for example, a material selected from calcium oxide, alumina, silica, titania, indium oxide, tin oxide, and silicon oxide.

FIGS. **6**A to **6**C are process diagrams of a method for manufacturing an organic light-emitting display device according to a comparative example.

Referring to FIG. **6**A, the method for manufacturing the organic light-emitting display device according to a comparative example includes forming the OLED **415** on the substrate **410**.

In the formation of the OLED **415** on the substrate **410**, the OLED **415** including the first electrode **420**, the second electrode **440** corresponding to the first electrode **420**, and the organic layer **430** disposed between the first electrode **420** and the second electrode **440** may be formed on one surface of the substrate **410** for each unit pixel.

Referring to FIGS. **6**B and **6**C, the method for manufacturing the organic light-emitting display device according to a comparative example includes forming the protective layer **460** with a metal oxide film on the second electrode **440**.

In the formation of the protective layer **460**, the protective layer **460** may be formed using a metal oxide, for example, a silicon oxide (SiOx) (where x is a real number larger than 1). For example, the protective layer **460** may be made of silicon oxide (SiOx) using hexamethyldisiloxane and oxygen in a plasma atmosphere through MOCVD.

Referring to FIG. **6**B, in order to form the protective layer **460** using the silicon oxide (SiOx) through MOCVD, an oxygen (O_2) gas in a plasma state which reacts with hexamethyldisiloxane in a manufacturing apparatus **500** is used. However, when the specific gravity of the oxygen (O_2) gas is low, the silicon oxide itself is not generated and it is difficult to prevent moisture permeation due to poor metal oxide film quality. When the specific gravity of the oxygen (O_2) gas is high, a light-emitting layer including an organic material may be damaged due to oxygen ion bombardment and the high oxidizing power of plasma itself when the plasma is generated, so that a dark spot may be generated when the device is turned on, or the protective layer **460** or the second electrode may be peeled off. FIG. **7** illustrates a phenomenon in which a side surface of the protective layer **460** is peeled off in an organic light-emitting display device according to a comparative example.

FIG. **8** is a cross-sectional view of an organic light-emitting display device according to still another embodiment.

Referring to FIG. **8**, an organic light-emitting display device **600** according to still another embodiment may include an OLED **615** disposed on a substrate **610**, an anti-peeling layer **650** disposed on the OLED **615**, and a protective layer **660** disposed on the anti-peeling layer **650**.

A light-emitting layer is provided in an organic layer **630** between a first electrode **620** and a second electrode **640**. At least one or more of a hole injection layer, a hole transport layer, an electron transport layer, and an electron injection layer, in addition to the light-emitting layer, may be further provided in the organic layer **630**. The organic layer **630** may be made of a low-molecular-weight organic material or a high-molecular-weight organic material.

However, the anti-peeling layer **650** which is not affected by an oxygen (O_2) gas is formed below the protective layer **660** between the second electrode **640** and the protective layer **660** using MOCVD, thereby protecting the OLED **615** and preventing the protective layer **660** or the second electrode from peeling off.

The organic light-emitting display device **600** according to still another embodiment may include an encapsulation layer **670** disposed on the protective layer **660**. The encapsulation layer **670** may surround side surfaces of the OLED **615**, the anti-peeling layer **650**, and the protective layer **660**, which are positioned on the substrate **610**, together with an upper surface of the protective layer **660**.

The encapsulation layer **670** may be made of a resin and may include at least one selected from, for example, an epoxy resin, a phenol resin, an amino resin, a silicone resin, an acryl resin, a vinyl resin, and an olefin resin.

In the manufacturing process, as described with reference to FIGS. **4**A to **4**E, the OLED **615**, the anti-peeling layer **650**, and the protective layer **660** may be sequentially formed on the substrate **610**, and then the encapsulation layer **670** may be formed on the protective layer **660** using a resin.

The encapsulation layer **670** may additionally prevent the penetration of oxygen or moisture from the outside, thereby protecting the OLED **615** and significantly improving the quality of the product.

The organic light-emitting display device according to the above-described embodiments may prevent the OLED from being damaged or prevent the protective layer or the second electrode from peeling off, regardless of the material of the protective layer and the manufacturing process thereof, thereby significantly improving the quality of the product.

The above description and the accompanying drawings provide an example of the technical idea of the present disclosure for illustrative purposes only. Those having ordinary knowledge in the technical field, to which the present disclosure pertains, will appreciate that various modifications and changes in form, such as combination, separation, substitution, and change of a configuration, are possible without departing from the essential features of the present disclosure. Therefore, the embodiments disclosed in the present disclosure are intended to illustrate the scope of the technical idea of the present disclosure, and the scope of the present disclosure is not limited by the embodiment. The scope of the present disclosure shall be construed on the basis of the accompanying claims in such a manner that all of the technical ideas included within the scope equivalent to the claims belong to the present disclosure.

The various embodiments described above can be combined to provide further embodiments. All of the U.S. patents, U.S. patent application publications, U.S. patent applications, foreign patents, foreign patent applications and non-patent publications referred to in this specification and/or listed in the Application Data Sheet are incorporated herein by reference, in their entirety. Aspects of the embodiments can be modified, if necessary to employ concepts of the various patents, applications and publications to provide yet further embodiments.

These and other changes can be made to the embodiments in light of the above-detailed description. In general, in the following claims, the terms used should not be construed to limit the claims to the specific embodiments disclosed in the specification and the claims, but should be construed to include all possible embodiments along with the full scope of equivalents to which such claims are entitled. Accordingly, the claims are not limited by the disclosure.

What is claimed is:

1. An organic light-emitting display device, comprising:

a substrate;

a first electrode disposed on the substrate;

an organic layer disposed on the first electrode;

a second electrode disposed on the organic layer, the second electrode includes a metal;

an anti-peeling layer disposed on the second electrode, the anti-peeling layer including an inorganic material, the inorganic material is a metal nitride of the metal included in the second electrode; and

a protective layer disposed on the anti-peeling layer, the protective layer including a metal oxide.

2. The organic light-emitting display device of claim **1**, wherein the inorganic material included in the anti-peeling layer is an inorganic material that does not include oxygen.

3. An organic light-emitting display device, comprising:

a substrate;

a first electrode disposed on the substrate;

an organic layer disposed on the first electrode;

a second electrode disposed on the organic layer, the second electrode includes a metal; and

an anti-peeling layer disposed on the second electrode, the anti-peeling layer including an inorganic material,

wherein the metal of the second electrode includes aluminum, and the anti-peeling layer includes aluminum nitride.

4. The organic light-emitting display device of claim **1**, wherein the metal oxide of the protective layer includes a silicon oxide.

5. The organic light-emitting display device of claim **1**, wherein a thickness of the protective layer is greater than a thickness of the anti-peeling layer.

6. The organic light-emitting display device of claim **1**, further comprising:

an encapsulation layer disposed on the protective layer.

7. A method for manufacturing an organic light-emitting display device, comprising:

forming a first electrode on a substrate;

forming an organic layer on the first electrode;

forming a second electrode on the organic layer, wherein the second electrode includes a metal;

forming an anti-peeling layer that includes an inorganic film on the second electrode; and

forming a protective layer that includes a metal oxide film on the anti-peeling layer, the anti-peeling layer includes a metal nitride of the metal of the second electrode.

8. A method for manufacturing an organic light-emitting display device, comprising:

forming a first electrode on a substrate;

forming an organic layer on the first electrode;

forming a second electrode on the organic layer, the second electrode includes aluminum;

forming an anti-peeling layer that includes an inorganic film on the second electrode; and

forming a protective layer that includes a metal oxide film on the anti-peeling layer,

wherein the anti-peeling layer is made of metal nitride through nitrogen plasma treatment on aluminum.

9. The method for manufacturing an organic light-emitting display device of claim **8**, wherein, in the forming the anti-peeling layer, the anti-peeling layer is made of an inorganic material through Plasma Enhanced Chemical Vapor Deposition (PECVD), and in the forming the protective layer, the protective layer is made of a silicon oxide using hexamethyldisiloxane and oxygen through Metalorganic Chemical Vapor Deposition (MOCVD).

10. The organic light-emitting display device of claim **3**, wherein the inorganic material included in the anti-peeling layer is an inorganic material that does not include oxygen.

11. The organic light-emitting display device of claim **3**, further comprising:

a protective layer disposed on the anti-peeling layer, the protective layer including a metal oxide, wherein the metal oxide of the protective layer includes a silicon oxide.

12. The organic light-emitting display device of claim **3**, further comprising:

a protective layer disposed on the anti-peeling layer, wherein a thickness of the protective layer is greater than a thickness of the anti-peeling layer.

13. The organic light-emitting display device of claim **3**, further comprising:

a protective layer disposed on the anti-peeling layer, the protective layer including a metal oxide; and

an encapsulation layer disposed on the protective layer.

14. The method for manufacturing an organic light-emitting display device of claim **7**, wherein, in the forming the anti-peeling layer, the anti-peeling layer is made of an inorganic material through PECVD, and in the forming the protective layer, the protective layer is made of a silicon oxide using hexamethyldisiloxane and oxygen through MOCVD.

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专利名称(译)	有机发光显示装置及其制造方法		
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[标]申请(专利权)人(译)	乐金显示有限公司		
申请(专利权)人(译)	LG DISPLAY CO. , LTD.		
当前申请(专利权)人(译)	LG DISPLAY CO. , LTD.		
[标]发明人	SUNG BONGKYU YU HUISEONG		
发明人	SUNG, BONGKYU YU, HUISEONG		
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摘要(译)

本发明提供一种有机发光显示装置，包括：基板;第一电极，配置为设置在基板上;有机层，配置为设置在第一电极上;第二电极，配置为设置在有机层上;抗剥离层，被配置为设置在第二电极上并包括无机材料;保护层，其配置为设置在抗剥离层上并包括金属氧化物，以及制造有机发光显示装置的方法。