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Kwack et al.

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

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H01L 51/50 (2006.01)

(52) **U.S. Cl.** **257/98**; 257/103; 257/E51.022; 257/E25.008

(58) **Field of Classification Search** 257/40, 257/642-643, 759, E51.001-E51.052, E25.008-E25.009
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,379,743	B1	4/2002	Lee et al.	
2001/0005528	A1	6/2001	Lee et al.	
2003/0194484	A1*	10/2003	Yamazaki et al.	427/66
2004/0140762	A1	7/2004	Tohma et al.	
2005/0146267	A1*	7/2005	Lee et al.	313/506
2008/0018230	A1	1/2008	Yamada et al.	

FOREIGN PATENT DOCUMENTS

JP	2001-326077		11/2001
KR	10-1999-0031560		5/1999
KR	10-2004-0065183	A	7/2004
KR	10-2004-0065554		7/2004
KR	10-2007-0024547	A	3/2007

* cited by examiner

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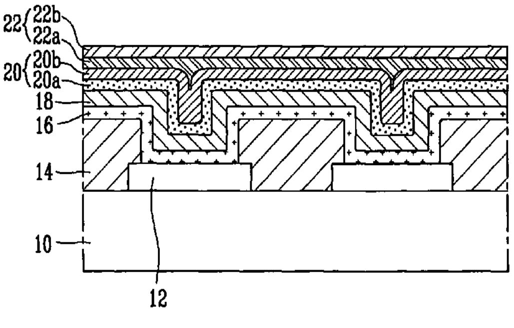
(57) **ABSTRACT**

An organic light emitting display includes a substrate, an OLED including an anode electrode, a cathode electrode and an organic thin film formed between the anode electrode and the cathode electrode, a reflective layer on the OLED, the reflective layer comprising a laminated first material and second material, the first material and the second material having different refractive indices, and an encapsulation layer on the reflective layer, the encapsulation layer comprising at least one of organic thin film and inorganic thin film.

13 Claims, 5 Drawing Sheets



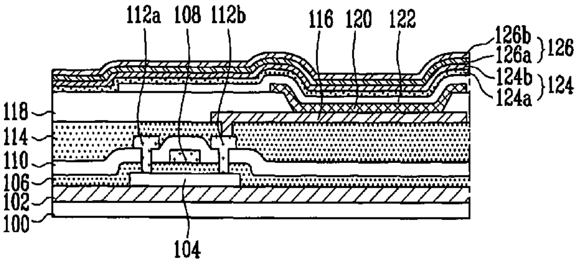


FIG. 1

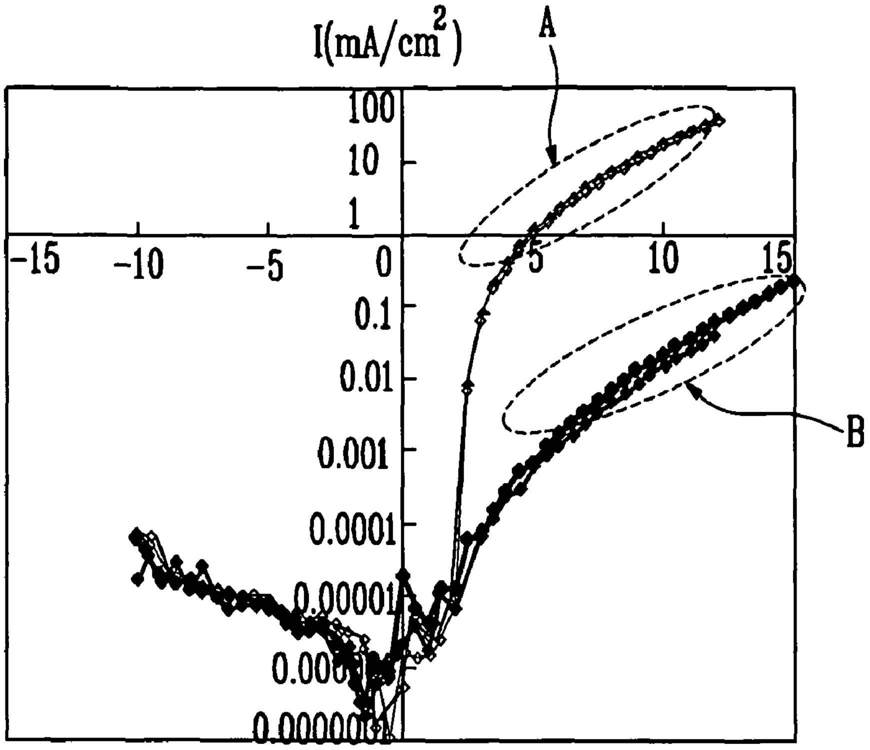
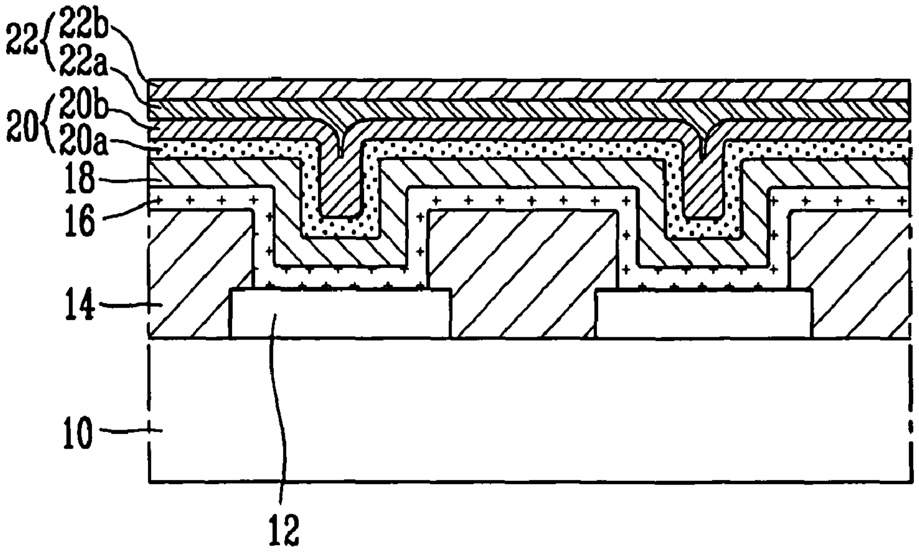

I(mA/cm^2)
A
B
100
10
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
0.0000001
-15
-10
-5
0
5
10
15

FIG. 2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22b
22a
20
20b
20a
18
16
14
10
12

FIG. 3

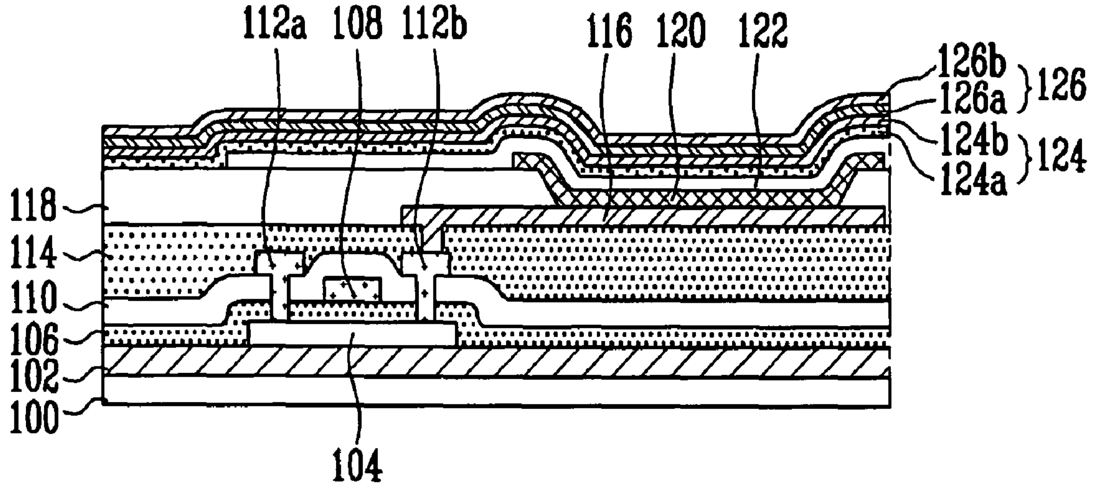

112a
108
112b
116
120
122
126b
126a
126
124b
124a
124
118
114
110
106
102
100
104

FIG. 4A

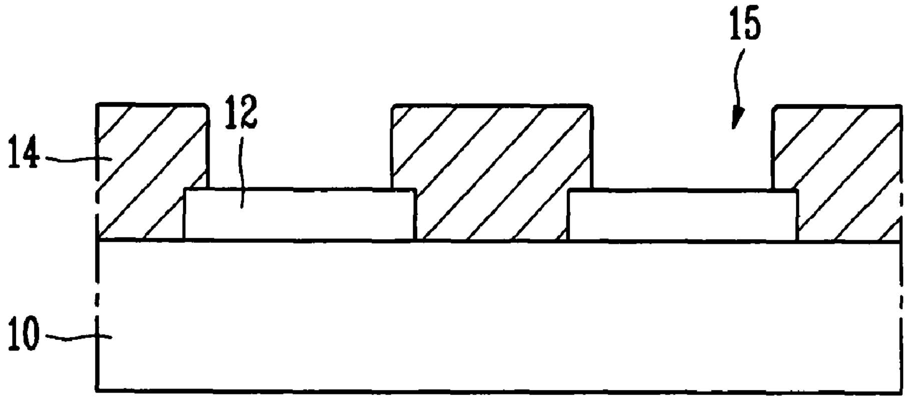

15
14
12
10

FIG. 4B

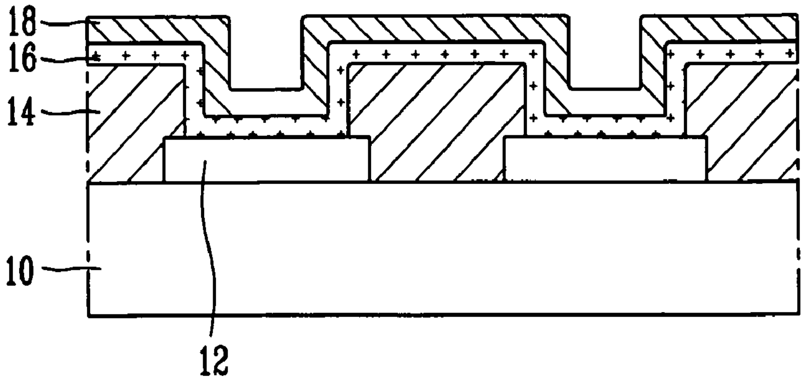


FIG. 4C

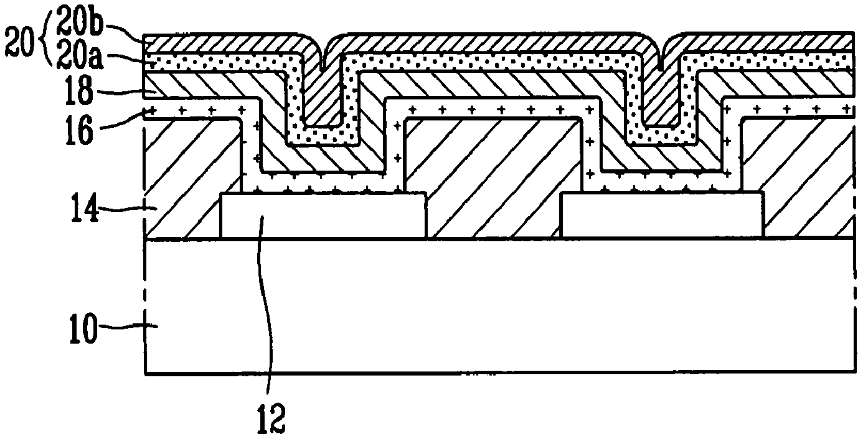


FIG. 4D

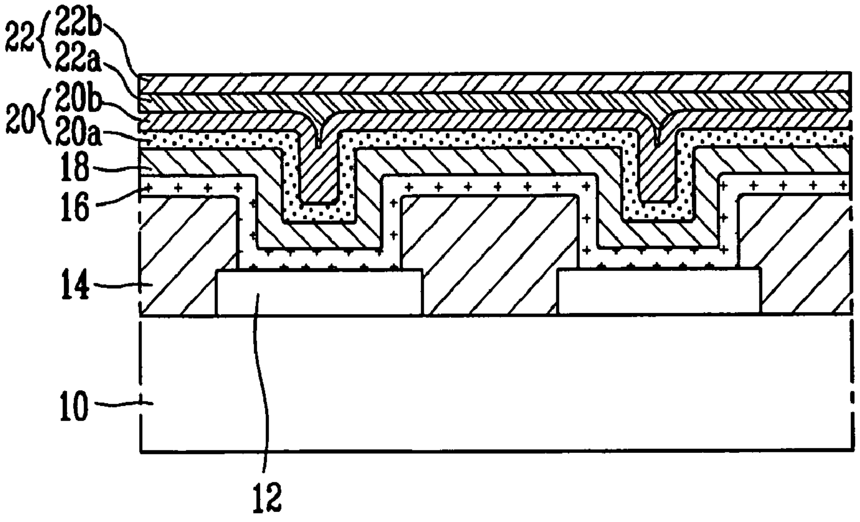


FIG. 5A

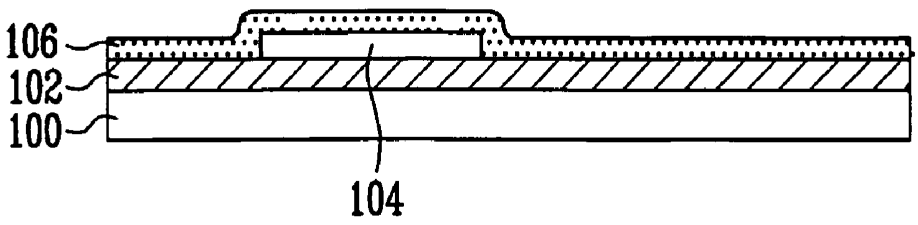


FIG. 5B

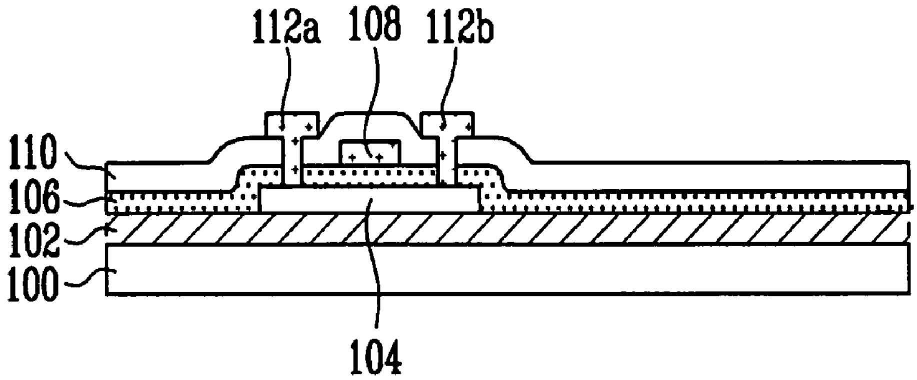


FIG. 5C

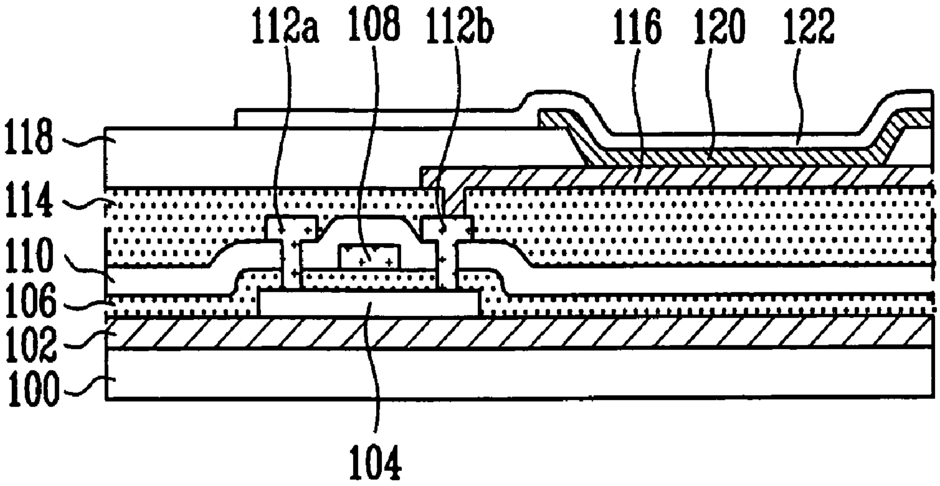


FIG. 5D

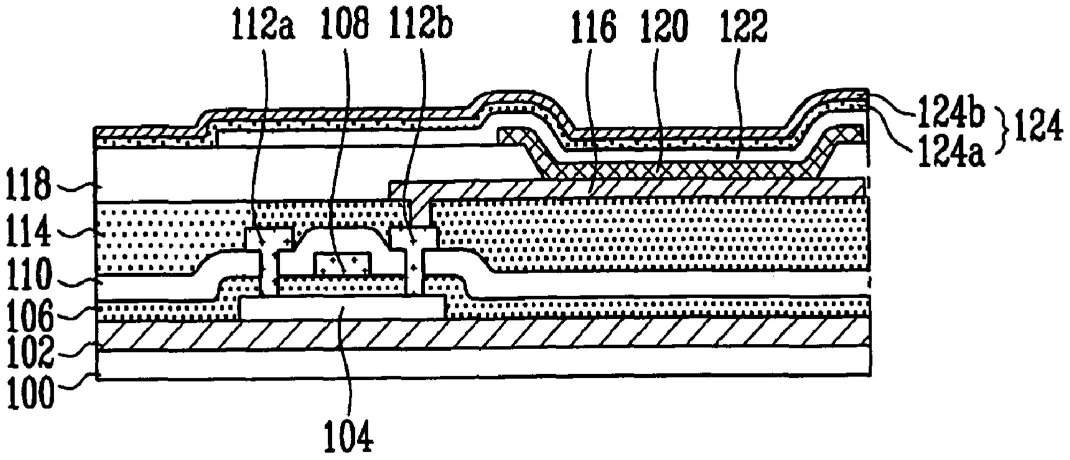
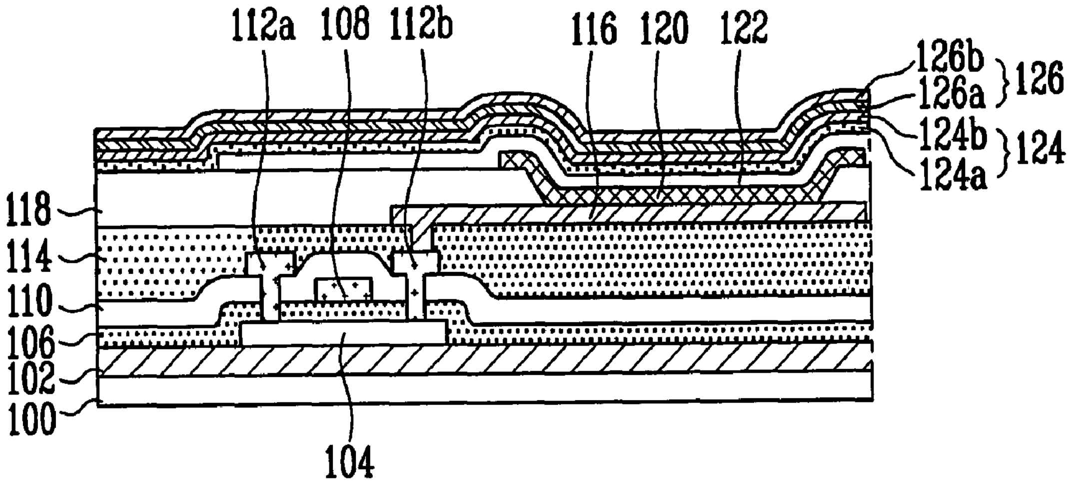

112a
108
112b
116
120
122
124b
124a
124
118
114
110
106
102
100
104

FIG. 5E


112a
108
112b
116
120
122
126b
126a
126
124b
124a
124
118
114
110
106
102
100
104

ORGANIC LIGHT EMITTING DIODE (OLED) DISPLAY AND METHOD OF MANUFACTURING THE SAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

Embodiments relate to an organic light emitting diode (OLED) display and a method of manufacturing the same. More particularly, embodiments relate to an OLED display that may be less susceptible to deterioration of electrical characteristics due to ultraviolet (UV) radiation than conventional displays, and a method of manufacturing the same.

2. Description of the Related Art

In general, organic light emitting diode (OLED) displays exhibit self-emission characteristics, i.e., self-luminous, and have higher performance in terms of wider viewing angle, higher brightness and contrast, near instantaneous response speed, and low power consumption with thin and compact form factor over liquid crystal displays (LCDs).

An OLED display includes a plurality of OLEDs coupled between a matrix of scan lines and data lines to form a plurality of pixels. An OLED includes an anode electrode, a cathode electrode, and an organic thin film layer formed between the anode electrode and the cathode electrode. An OLED further includes a hole transport layer, an organic light emitting layer, and an electron transport layer. If a given voltage is applied to the anode electrode and the cathode electrode, the holes injected through the anode electrode and the electrons injected through the cathode electrode are recoupled with each other in the organic light emitting layer. As a result, light is emitted due to a difference in energy.

Since OLED displays include organic materials, OLED displays are vulnerable to attack by hydrogen or oxygen. Additionally, since the cathode electrode is made of a metal material, the cathode electrode may be easily oxidized by moisture in the air which leads to deterioration in electrical and light emitting characteristics. In order to prevent electrical and light emitting characteristics from deteriorating, a can or cup shaped container made of a metal material, or a sealing substrate made of glass or plastic is typically provided on a substrate on which the OLED may be formed. The container or sealing substrate and substrate are then sealed via a sealant such as epoxy-based sealants.

It is difficult, however, to apply such a configuration to a thin or flexible OLED display. Accordingly, in order to seal a thin or flexible OLED display, a thin film encapsulation technology may be employed. Ultraviolet (UV) radiation is typically used in employing thin film encapsulation technology to form OLED displays. If UV radiation is irradiated onto the organic thin film layer, however, thermal damage is generated. Such thermal damage negatively affects and changes the characteristics of the organic thin film layer, and surface characteristics between the organic thin film layer and the cathode electrode are also negatively affected. Accordingly, there remains a need to address one or more of these drawbacks and disadvantages of the related art.

SUMMARY OF THE INVENTION

Embodiments are therefore directed to an OLED display that may address one or more of the drawbacks and disadvantages of the related art.

It is therefore a feature of an embodiment of the present invention to provide an OLED display having a reduced change in the electric characteristics caused by UV radiation.

At least one of the above and other features of the present invention may be realized by providing an OLED display including a substrate, an OLED including an anode electrode, a cathode electrode and an organic thin film formed between the anode electrode and the cathode electrode, a reflective layer on the OLED, the reflective layer comprising a laminated first material and second material, the first material and the second material having different refractive indices, and an encapsulation layer on the reflective layer, the encapsulation layer comprising at least one of organic thin film and inorganic thin film.

The refractive indices of the first material and the second material of the reflective layer may have a relative difference within a range of approximately 1.2 to 4.0. The first material of the reflective layer may include one or more of a photo acryl, BaF_2, CsF, $Na_5Al_3F_{14}$, KCl, SiO, and Alq_3, and the second material of the reflective layer may include one or more of a silicone nitride (SiN), Cu_2O, Fe_2O_3, TiO_2, and ZnSe.

The organic thin film of the encapsulation layer may include an ultraviolet radiation curing material. The optical thickness of the first material and the second material of the reflective layer may be about $\lambda/4$ of a wavelength of ultraviolet radiation used to cure the organic film of the encapsulation layer.

The OLED may further include a thin film transistor formed on the substrate and coupled with the anode electrode. Further, the cathode electrode may be translucent.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other features and advantages of the present invention will become more apparent to those of ordinary skill in the art by describing in detail exemplary embodiments thereof with reference to the attached drawings, in which:

FIG. **1** illustrates a graph of a change in the electric characteristics (I-V) of an OLED that may be caused by UV radiation;

FIG. **2** illustrates a sectional view of an OLED display according to a first embodiment of the present invention;

FIG. **3** illustrates a sectional view of an OLED display according to a second embodiment of the present invention;

FIGS. **4**A to **4**D illustrate sectional views of a method of fabricating an OLED display according to the first embodiment of the present invention; and

FIGS. **5**A to **5**E illustrate sectional views of a method of fabricating an OLED display according to the second embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Korean Patent Application No. 10-2007-0052726, filed on May 30, 2007, in the Korean Intellectual Property Office, and entitled: "Organic Light Emitting Display and Method of Manufacturing the Same" is incorporated by reference herein in its entirety.

The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are illustrated. The invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

In the figures, the dimensions of layers and regions may be exaggerated for clarity of illustration. It will also be understood that when a layer or element is referred to as being "on" another layer or substrate, it can be directly on the other layer or substrate, or intervening layers may also be present. Further, it will be understood that when a layer is referred to as being "under" another layer, it can be directly under, and one or more intervening layers may also be present. In addition, it will also be understood that when a layer is referred to as being "between" two layers, it can be the only layer between the two layers, or one or more intervening layers may also be present. Further, like reference numerals refer to like elements throughout.

FIG. **1** illustrates a graph including curve A and curve B. Curve A illustrates a measurement result before UV irradiation of the OLED and curve B illustrates a measurement result after UV irradiation of the OLED. As illustrated in the graph of FIG. **1**, if UV radiation is irradiated onto the organic thin film layer of the OLED, thermal damage may be generated. The thermal damage may change the characteristics of the organic thin film layer and surface characteristics between the organic thin film layer and a cathode electrode. This may result in electric characteristics (I-V-L) of the OLED being positively shifted, or may result in leakage current being generated in the OLED. This may result in a higher voltage being required in order to obtain the same brightness (cd), and/or may result in a reduction in life of the OLED, for example.

FIG. **2** illustrates a sectional view of a passive matrix type OLED including an OLED formed on a substrate **10**. A reflective layer **20** is formed on the OLED, the reflective layer including one or more laminated substances with different refractive indices. An encapsulation layer **22** is formed on the reflective layer **20** to seal or encapsulate the OLED.

The OLED may include an anode electrode **12** formed on the substrate **10** and arranged in a first direction. The OLED may include a cathode electrode **18** formed in a second direction approximately perpendicular to the first direction to cross the anode electrode **12**. An organic thin film **16** may be formed between the anode electrode **12** and the cathode electrode **18**. Although not illustrated in detail, the organic thin film **16** may include a structure in which a hole transport layer, an organic light emission layer, and an electron transport layer may be laminated. The organic thin film **16** may further include a hole injection layer and an electron injection layer. The OLED may further include an insulation layer **14**. The insulation layer **14** may be formed from an organic or an inorganic substance.

The reflective layer **20** may include a dual layer structure in which substances with different refractive indices such as a thin film **20***a* with a low refractive index and a thin film **20***b* with high refractive index may be laminated.

Although reflective layer **20** is depicted as having a dual layer structure, it is not limited thereto, and the reflective layer **20** may be a multi-layer structure including more than two layers or may be formed from a single layer, for example.

Moreover, the encapsulation layer **22** may include a lamination of an organic thin film **22***a* and an inorganic thin film **22***b*. Although only a dual layer of the organic thin film **22***a* and the inorganic thin film **22***b* is depicted in the drawings, it is not limited thereto and the encapsulation layer **22** may be formed in the multi-layer structure or may be formed from a single layer, for example.

FIG. **3** illustrates a sectional view of an OLED display, and may be an active matrix type OLED display in which respective pixels are controlled by a thin film transistor (TFT). Further, the OLED display illustrated in FIG. **3** may illustrate one OLED of the OLED display. The active matrix type OLED display illustrated in FIG. **3** includes a TFT formed on a substrate **100**, and an OLED coupled with the TFT. The active matrix type OLED display further includes a reflective layer **124** formed on the OLED, the reflective layer **124** including a laminated structure of substances with different refractive indices. The active matrix type OLED display further includes an encapsulation layer **126** for sealing the OLEDs of the OLED display.

The TFT may include a semiconductor layer **104** for providing a channel region and a source and drain region. The TFT may further include a gate electrode **108** formed on the semiconductor layer **104** in the channel region and insulated from the semiconductor layer **104** by an insulation layer **106**. The TFT may further include source and drain electrodes **112***a* and **112***b*, which may contact the source and drain regions of semiconductor layer **104** via contact holes formed in interlayer insulation layer **110**.

The OLED may include an anode electrode **116** coupled with the source electrode **112***a* or the drain electrode **112***b*, but illustrated here as contacting the drain electrode **112***b*. The anode electrode may be coupled to the source electrode **112***a* or the drain electrode **112***b* through a via hole formed in a flattening layer **114**.

The OLED may further include an organic thin film layer **120** formed on the anode electrode **116** in a light emitting region exposed by a pixel definition layer **118**, and a cathode electrode **122** formed on the pixel definition layer **118** including the organic thin film layer **120**. The organic thin film layer **120** may be formed by laminating a hole transport layer, an organic light emitting layer, and an electron transport layer (not shown), and may further include a hole injection layer and an electron injection layer (not shown). The OLED may further include a buffer layer **102** formed on the substrate **100** and a gate insulation layer **106** formed on the upper side containing the semiconductor layer **104**. The OLED may further include an interlayer insulation layer **110** formed on the insulation layer **106** and the gate electrode **108**.

The reflective layer **124** may include a laminated structure of substances with different refractive indices, such as a thin film **124***a* with a low refractive index and a thin film **124***b* with a high refractive index. Conversely, the reflective layer **124** may include a thin film **124***a* with a high refractive index and a thin film **124***b* with a low refractive index. Although a dual layer type refractive layer **124** is depicted in the drawings, it is not limited thereto and may be a multi-layer structure or may be formed from a single layer, for example.

Moreover, the encapsulation layer **126** may include a laminated organic thin film **126***a* and an inorganic thin film **126***b* or may include an inorganic thin film **126***b* and an organic thin film **126***a*. Although only dual layer of the organic thin film **126***a* and the inorganic thin film **126***b* is depicted in the drawings, it is not limited thereto and the encapsulation layer **126** may be a multi-layer structure, may be formed from a single layer or may include at least one of organic thin film and an inorganic thin film, for example.

Hereinafter, embodiments of a method of fabricating an OLED display according to the present invention will be described in detail with reference to FIGS. **4**A to **4**D and **5**A to **5**E.

Referring to FIG. **4**A, anode electrodes **12** may be arranged on substrate **10** in a first direction. An insulation layer **14** may be formed from organic or inorganic substances on the entire upper surface of substrate **10**. The insulation layer **14** may be patterned to form openings **15** such that portions of anode electrodes **12** in a light emitting region are exposed.

Referring to FIG. **4**B, partitions (not shown) may be formed on insulation layer **14** in a second direction which may be perpendicular with the first direction, such that the partitions cross anode electrodes **12** on substrate **10**. An organic thin film **16** may be formed on an insulation layer **14** and may cross anode electrodes **12** in a light emitting region, for example. In one embodiment, organic thin film **16** and the cathode electrodes **18** may be separated by the partition (not shown).

Referring to FIG. **4**C, a reflective layer **20** may be formed on cathode electrode **18**. Reflective layer **20** may comprise substances with different refractive indices, for example a thin film **20***a* with a low refractive index and a thin film **20***b* with a high refractive index. Alternatively, reflective layer **20** may comprise a thin film **20***b* with a high refractive index and a thin film **20***a* with a low refractive index may be laminated on the cathode electrode **18** to form a reflective layer **20**.

Referring to FIG. **4**D, a laminated encapsulation layer **22** may be formed on reflective layer **20**. Laminated encapsulation layer **22** may include an organic thin film **22***a* and an inorganic thin film **22***b*, or alternatively may include an inorganic thin film **22***b* and an organic thin film **22***a*. If thin film **22***a* is an organic thin film, organic thin film **22***a* may serve to flatten a surface and the inorganic thin film **22***b*, and may prevent or reduce the permeation of moisture and/or oxygen. The organic thin film **22***a* may be made of ultraviolet curing material. For example, the organic thin film **22***a* may include liquid monomer vapor-deposited and cured by ultraviolet radiation.

Referring to FIG. **5**A, a buffer layer **102** is formed on substrate **100**, and a semiconductor layer **104** is formed on a portion of buffer layer **102**. The semiconductor layer may be utilized to form a channel region, a source region and/or a drain region. A gate insulation layer **106** may be formed on the upper side containing the semiconductor layer **104**.

Referring to FIG. **5**B, a gate electrode **108** may be formed on the portion of the gate insulation layer **106** overlying the semiconductor layer **104**. An interlayer insulation layer **110** may be formed on the gate insulation layer **106** and the gate electrode **108**. The interlayer insulation layer **110** and the gate insulation layer **106** may be patterned to form contact holes to enable formation of source and drain electrodes. Source and drain electrodes **112***a* and **112***b* may be formed to contact the semiconductor layer **104** via the contact holes.

Referring to FIG. **5**C, a flattening layer **114** may be formed on the upper surface to flatten the upper surface. The flattening layer **114** may be patterned to form via holes (not shown) such that portions of the source or drain electrode **112***a* or **112***b* may be exposed. An anode electrode **116** may be formed to contact the source or drain electrode **112***a* or **112***b* through the via holes, but illustrated here as contacting the drain electrode **112***b*. A pixel definition layer **118** may be formed on the flattening layer **114** such that a portion of the anode electrode **116** in a light emitting region may be exposed. An organic thin film layer **120** may be formed on the exposed portion of the anode electrode **116**. Cathode electrode **122** may be formed on a portion of the pixel definition layer **118** and the organic thin film layer **120**.

Referring to FIG. **5**D, reflective layer **124** may be formed on cathode electrodes **122**. Reflective layer **124** may comprise substances with different refractive indices, for example a thin film **124***a* with a low refractive index and a thin film **124***b* with a high refractive index. Alternatively, reflective layer **124** may include a thin film **124***b* with a high refractive index and a thin film **124***a* with a low refractive index that may be laminated on the cathode electrodes **122** to form a reflective layer **124**.

Referring to FIG. **5**E, a laminated encapsulation layer **126** may be formed on reflective layer **124**. Laminated encapsulation layer **126** may include an organic thin film **126***a* and an inorganic thin film **126***b* or, alternatively, may include an inorganic thin film **126***b* and an organic thin film **126***a*. If thin film **126***a* is an organic thin film, organic thin film **126***a* may serve to flatten a surface and the inorganic thin film **126***b*, and may prevent or reduce the permeation of moisture and/or oxygen. The organic thin film **126***a* may be made of ultraviolet curing material. For example, the organic thin film **126***a* may include liquid monomer vapor-deposited and may be cured by ultraviolet radiation.

As described above, embodiments may form the reflective layers **20** and **124** by laminating the thin films **20***a* and **124***a* with a low refractive index and the thin films **20***b* and **124***b* with a high refractive index on the upper side of the OLED display. In this case, the refractive indices R of the reflective layers **20** and **124** may be expressed by the following Formula 1:

$$R = \left| \frac{\left(\frac{nL}{nH}\right)^{2N} - n_s}{\left(\frac{nL}{nH}\right)^{2N} + n_s} \right|^2 \qquad \text{Formula 1}$$

where nL denotes refractive indices of the thin films **20***a* and **124***a*, nH denotes refractive indices of the thin films **20***b* and **124***b*, and n_s denotes refractive indices of glass substrates **10** and **100**.

In accordance with Formula 1, one way to increase the refractive index R would be to increase the number of laminated layers of material having a large difference between refractive indices nL and nH. In this case, a vacuum deposition method may be employed to form a laminated layer. Since material having permeability higher than about 80% in a visible radiation region may have a refractive index n of about 1.2 to 4.0, a material with a relatively large refractive index difference within a range of about 1.2 to 4.0, for example, photo acryl and a nitride (SiN) may be employed. Moreover, in order to effectively prevent the ultraviolet radiation from permeating, thicknesses of the materials having different refractive indices may be preferably deposited to be about λ/4 of a wavelength (for example, about 200 nm to about 400 nm) of ultraviolet radiation used to cure the organic films **22***a* and **126***a*. Here, an optical thickness may be determined by multiplication of the refractive index and the thickness of material to be deposited, for example.

Since the ultraviolet radiation are not projected onto the OLED during the forming of the organic thin films **22***a* and **126***a* when the reflective layers **20** and **124** are formed on the upper side of the OLED display, reduction of electrical characteristics of the OLED may be prevented or reduced.

In an embodiment employing a glass substrate with a refractive index of about 1.6, the thin films **20***a* and **124***a* with a low refractive index may be selected from one or more of a photo acryl with a refractive index nL of about 1.5, BaF_2 of about 1.47, CsF of about 1.48, $Na_5Al_3F_{14}$ of about 1.33, KCl of about 1.49, SiO of about 1.6, and Alq_3 of about 1.7, and the thin films **20***b* and **124***b* with a high refractive index may selected from one or more of a silicone nitride (SiN) with a refractive index nH of about 2.0, Cu2O of about 2.71, Fe_2O_3 of about 3.01, TiO_2 of about 2.616, and ZnSe of about 2.89. In this case, the reflective layers **20** and **124** have a high refractive index of about 82%. Moreover, in another embodiment of the present invention, since transmittance of the ultraviolet radiation may be further decreased when the cathode electrodes **18** and **122** of the OLED may be formed to be translucent with a thin film such as Ag and Mg, further reduction in the effects of UV radiation may be realized.

As described above, if the reflective layer is formed by laminating materials with different refractive indices on the upper side of the OLED, the ultraviolet radiation may not be projected on the OLED during the forming of the organic thin film for the thin film encapsulation layer. Therefore, the electric characteristics of the organic layer may not be changed or may be minimally changed due to the projection of the ultraviolet radiation so that luminance characteristics and lifespan can be increased.

Although embodiments of the present invention have been shown and described, it should be appreciated by those skilled in the art that changes might be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

Exemplary embodiments of the present invention have been disclosed herein, and although specific terms are employed, they are used and are to be interpreted in a generic and descriptive sense only and not for purpose of limitation. Accordingly, it will be understood by those of ordinary skill in the art that various changes in form and details may be made without departing from the spirit and scope of the present invention as set forth in the following claims.

What is claimed is:

1. An organic light emitting diode (OLED) display, comprising:

a substrate;

an OLED including an anode electrode, a cathode electrode and an organic thin film formed between the anode electrode and the cathode electrode;

a reflective layer directly on the OLED, the reflective layer comprising a laminated first material and second material, the first material and the second material having different refractive indices; and

an encapsulation layer on the reflective layer, the encapsulation layer comprising at least one of an organic thin film and an inorganic thin film, and the organic thin film including a cured liquid monomer exposed to radiation.

2. The OLED display as claimed in claim **1**, wherein the refractive indices of the first material and the second material of the reflective layer have a relative difference within a range of approximately 1.2 to 4.0.

3. The OLED display as claimed in claim **1**, wherein the first material of the reflective layer includes one or more of a photo acryl, BaF_2, CsF, $Na_5Al_3F_{14}$, KCl, SiO, and Alq_3, and the second material of the reflective layer includes one or more of a silicone nitride (SiN), Cu_2O, Fe_2O_3, TiO_2, and ZnSe.

4. The OLED display as claimed in claim **1**, wherein the organic thin film of the encapsulation layer includes an ultraviolet radiation curing material, and the cured liquid monomer of the organic thin film is exposed to ultraviolet radiation.

5. The OLED display as claimed in claim **4**, wherein an optical thickness of the first material and the second material of the reflective layer is about $\lambda/4$ of a wavelength of ultraviolet radiation used to cure the organic film of the encapsulation layer.

6. The OLED display as claimed in claim **1**, further comprising a thin film transistor formed on the substrate and coupled with the anode electrode.

7. The OLED display as claimed in claim **1**, wherein the cathode electrode is translucent.

8. The OLED display as claimed in claim **1**, wherein:

the reflective layer is between the encapsulation layer and the OLED, and

the encapsulation layer is a stacked layer of the organic thin film and the inorganic thin film.

9. The OLED display as claimed in claim **1**, wherein:

the reflective layer is between the liquid monomer of the encapsulation layer and the cathode electrode, and

the encapsulation layer is a stacked layer of the organic thin film and the inorganic thin film.

10. The OLED display as claimed in claim **1**, wherein the OLED, the first material of the reflective layer, the second material of the reflective layer, the organic thin film of the encapsulation layer, and the inorganic thin film of the encapsulation layer are sequentially stacked.

11. The OLED display as claimed in claim **10**, wherein the first material has a first refractive index that is lower than a second refractive index of the second material.

12. The OLED display as claimed in claim **11**, wherein the cured liquid monomer is a UV-cured liquid monomer directly on the second material of the reflective layer.

13. The OLED display as claimed in claim **4**, wherein the cured liquid monomer is a UV-cured liquid monomer directly on the reflective layer.

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专利名称(译)	有机发光二极管（OLED）显示器及其制造方法		
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摘要(译)

有机发光显示器包括基板，包括阳极的OLED，阴极和形成在阳极和阴极之间的有机薄膜，OLED上的反射层，反射层包括层压的第一材料和第二材料，第一材料和具有不同折射率的第二材料，以及在反射层上的封装层，封装层包括有机薄膜和无机薄膜中的至少一种。