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(54) Title of the Invention: **Display device**
 Abstract Title: **Prevention of ingress of moisture into organic display device**

(57) The display device of the current application seeks to prevent penetration or ingress of external moisture and oxygen to improve the lifespan of the device. The device includes a substrate 110, a first electrode 130 positioned on the substrate, a second electrode 136; an organic emission layer 134 interposed between the first and the second electrode; an organic insulating film 170 positioned around the periphery of the second electrode defining an emission area emitting light from the organic emission layer; and a passivation film 142 covering the organic insulating film. In some embodiments there is a second passivation film 140 covering the whole of the first passivation film and insulating film.

FIG. 3

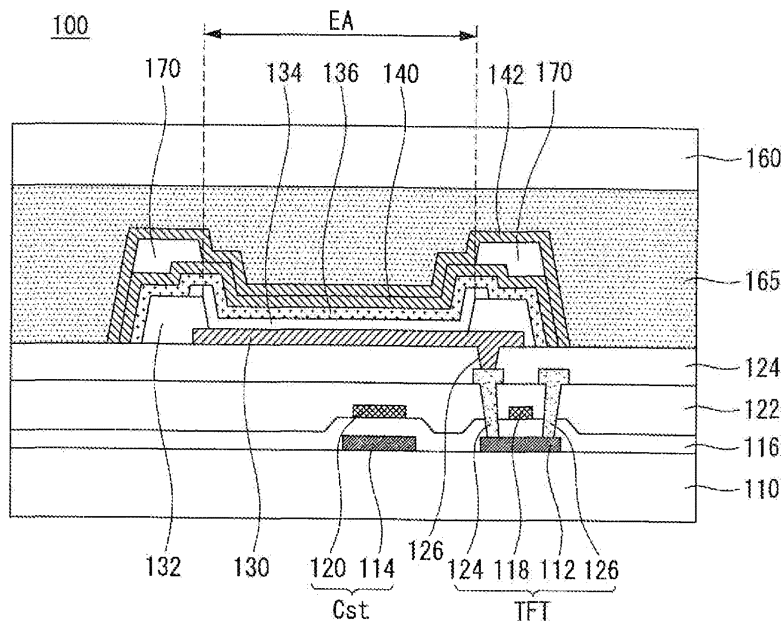


FIG. 1

(RELATED ART)

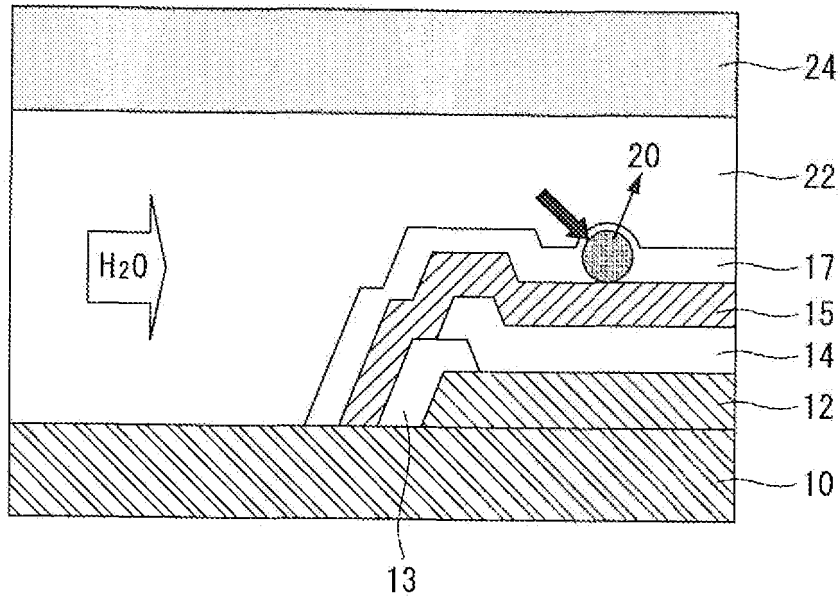


FIG. 2

(RELATED ART)

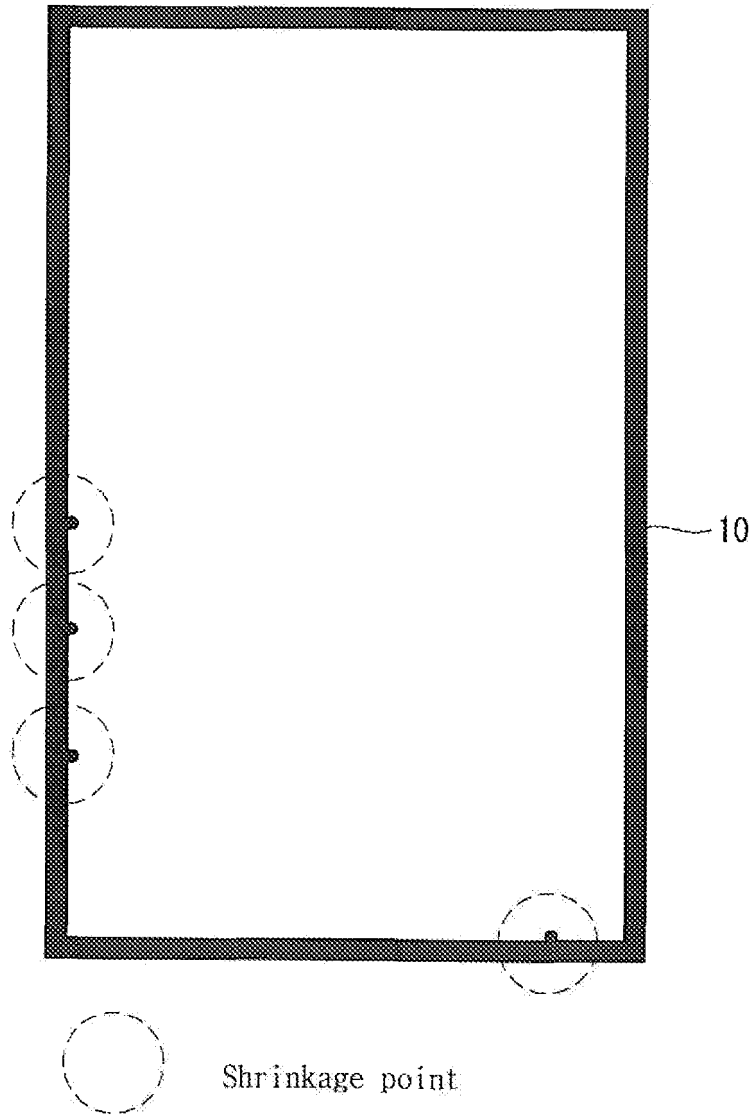


FIG. 3

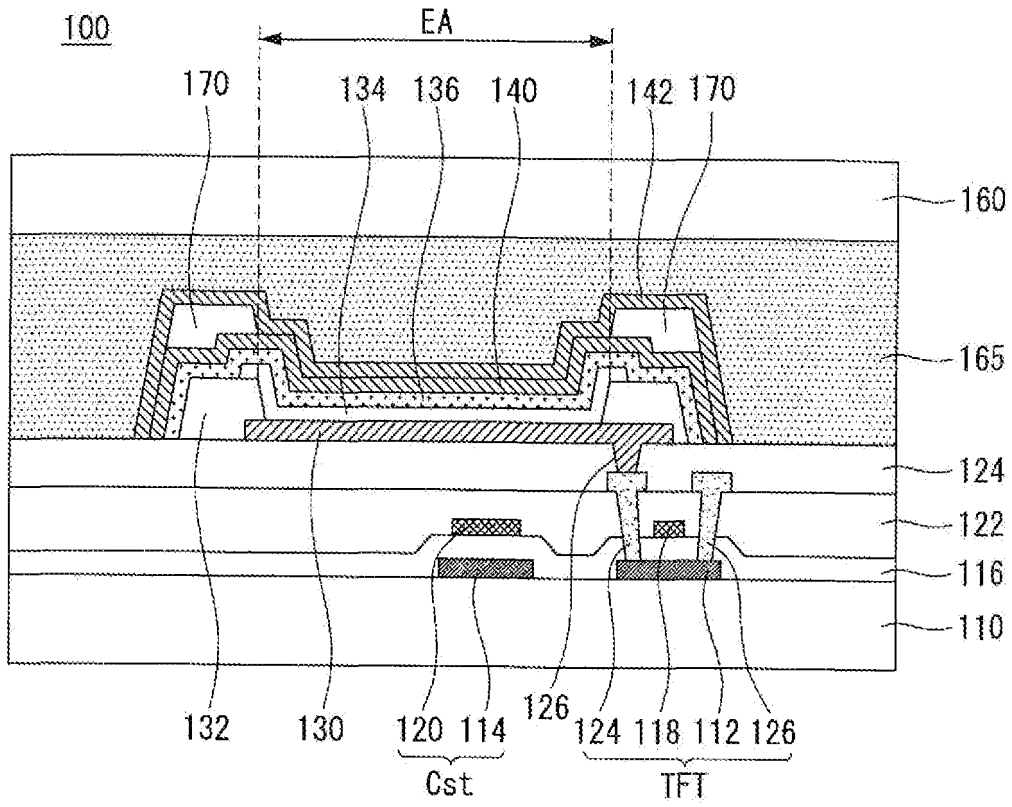


FIG. 4

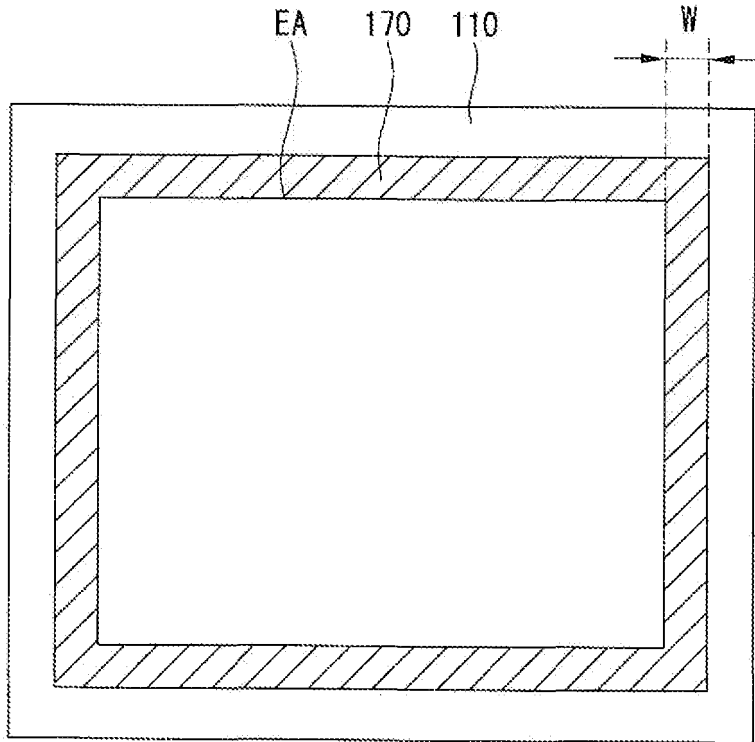


FIG. 5

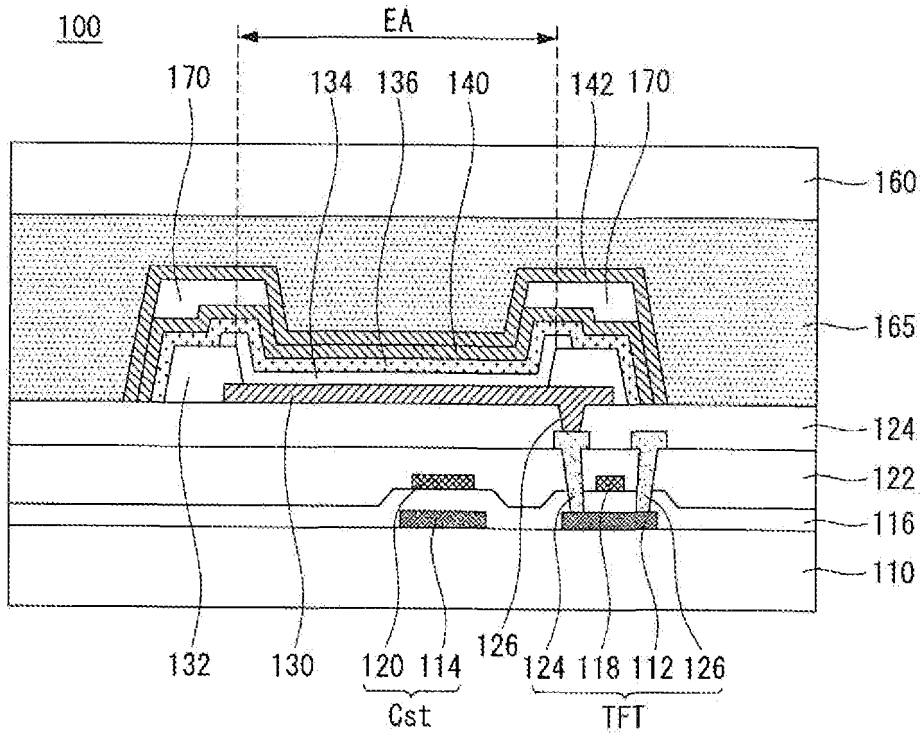


FIG. 6

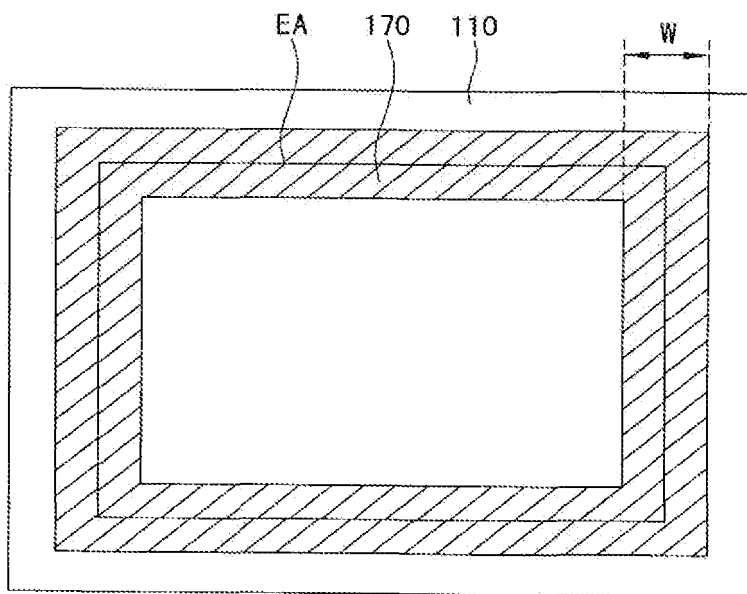


FIG. 7

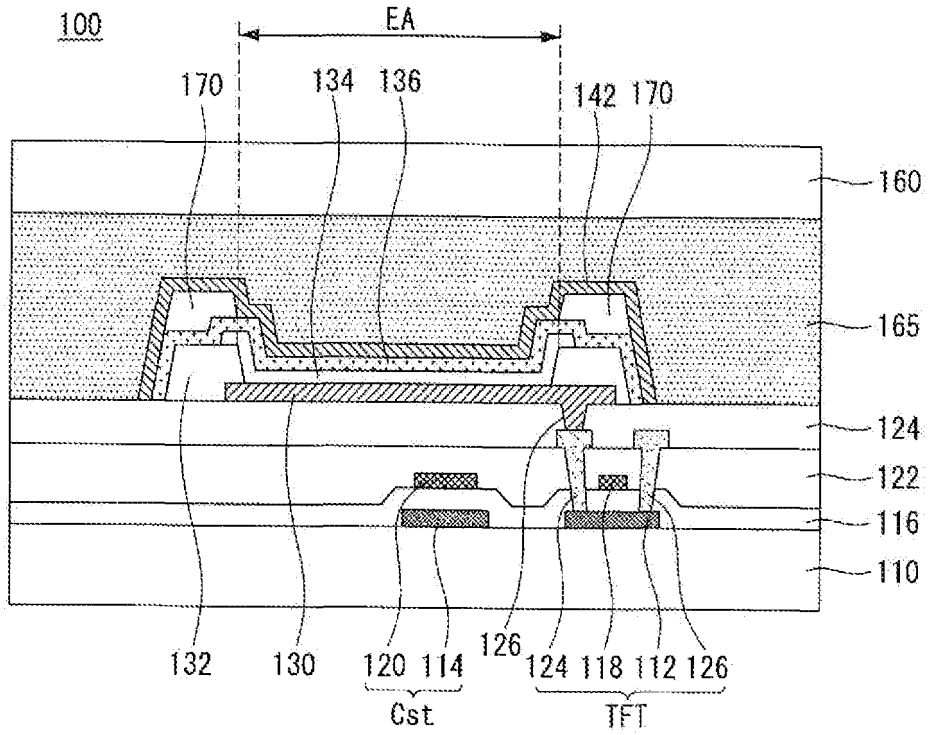


FIG. 8

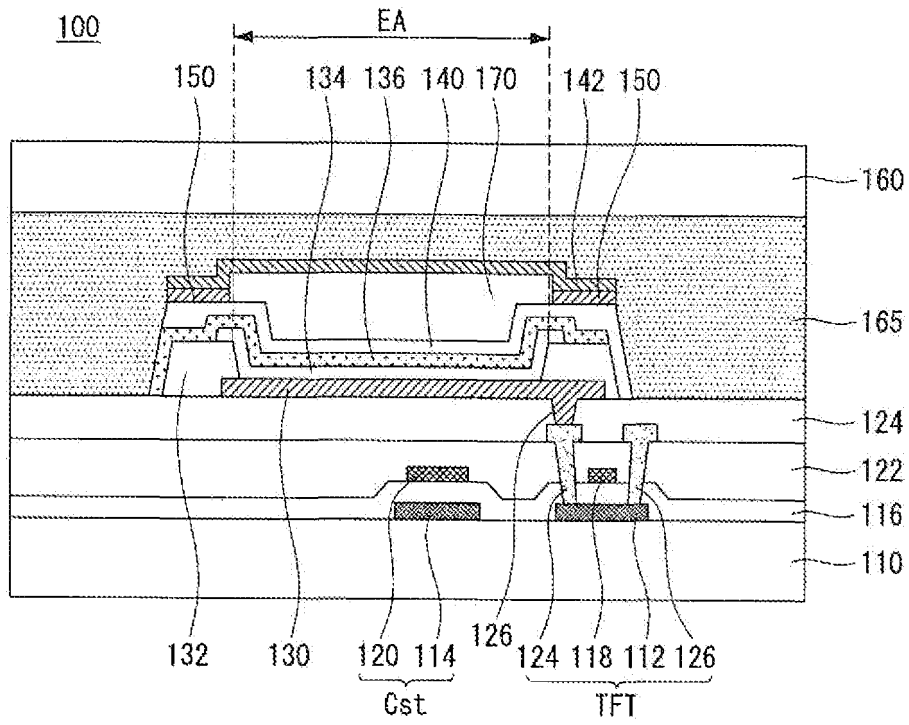


FIG. 9

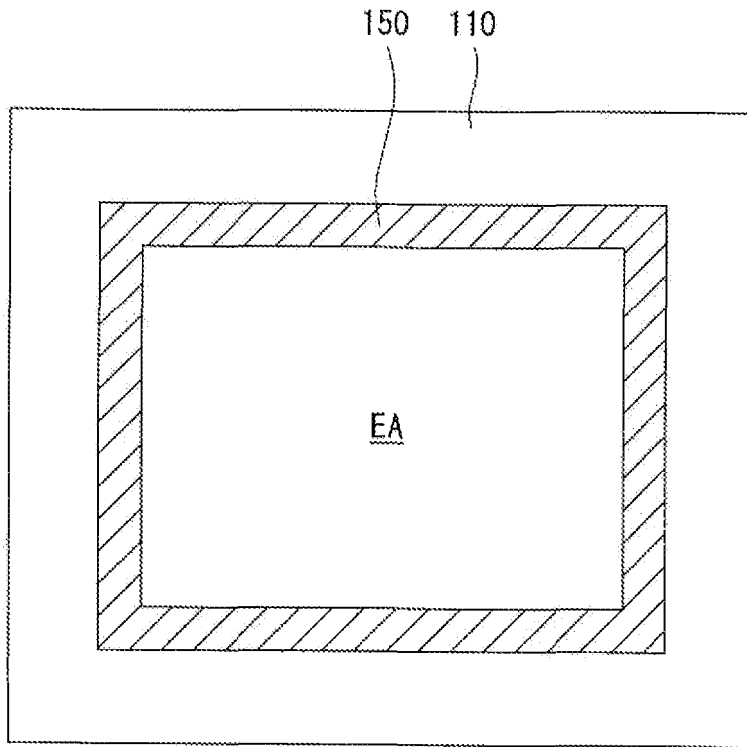


FIG. 10

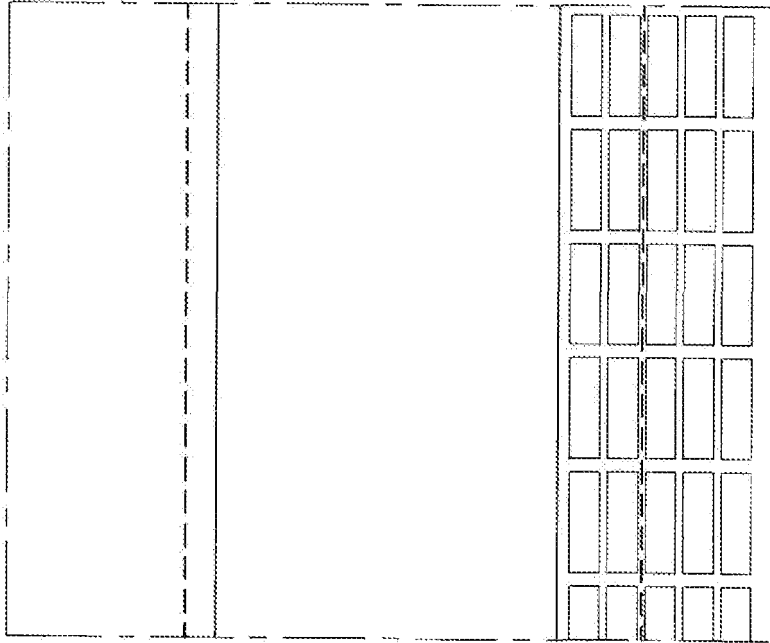


FIG. 11

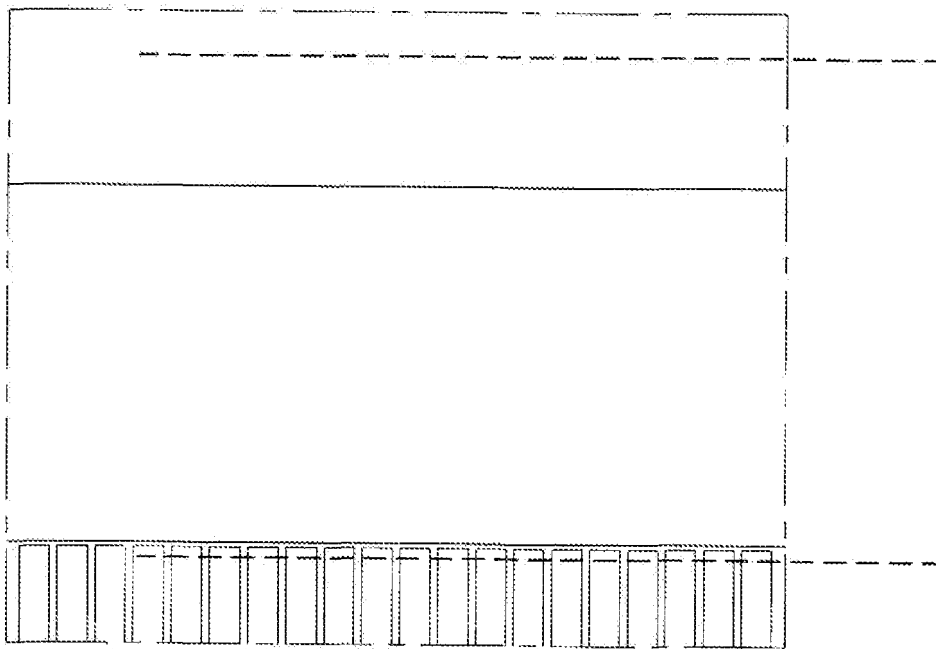
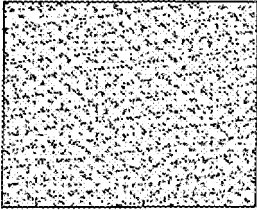
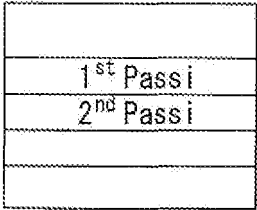
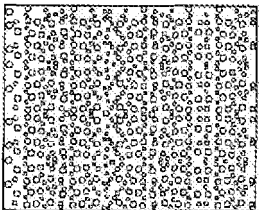
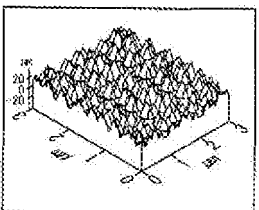


FIG. 12

< Comparative Example 2 >

SEM		AFM	
Surface	Cross section	morphology	3D Image
			



< Example 2 >

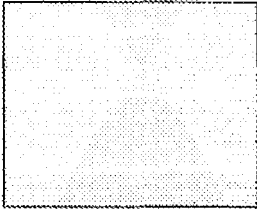
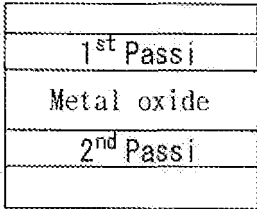
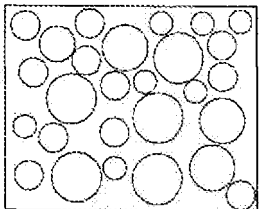
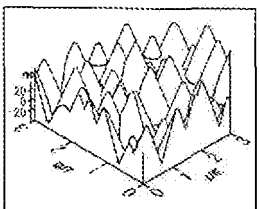
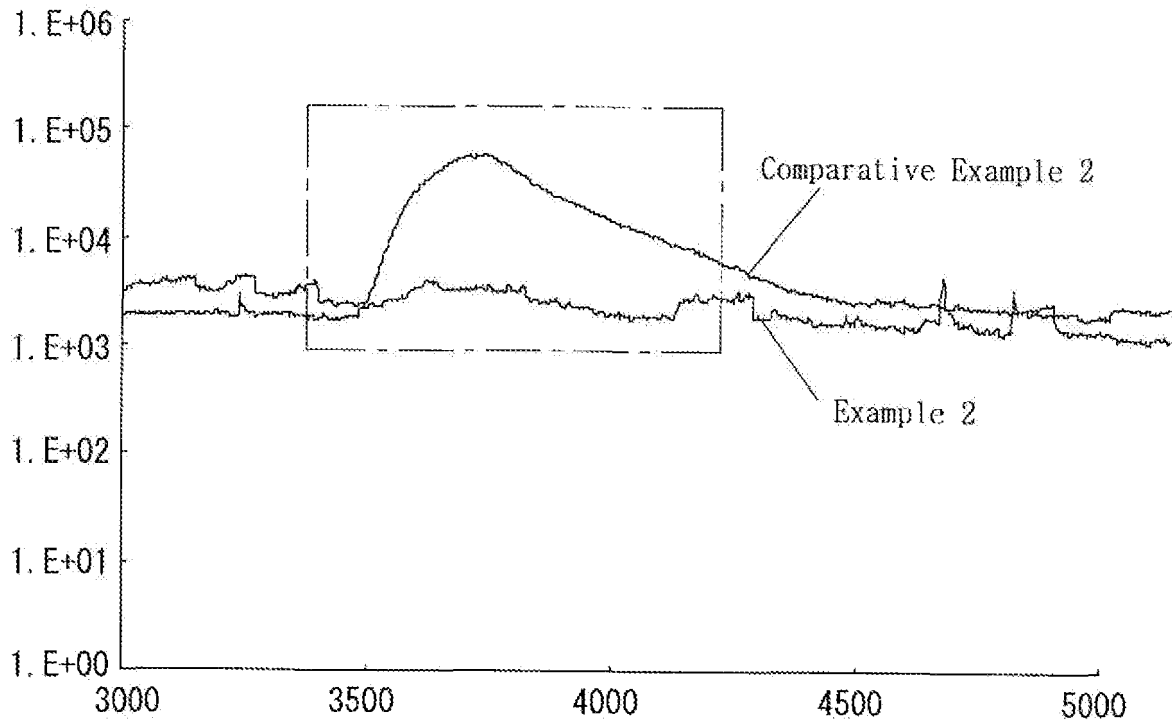
SEM		AFM	
Surface	Cross section	morphology	3D Image
			

FIG. 13



DISPLAY DEVICE

[0001] This application claims the priority benefit of Korean Patent Application NO. 10-2011-0100731 filed on October 4, 2011 and NO. 10-2011-0135824 filed on December 15, 2011, which is incorporated herein by reference for all purposes as if fully set forth herein.

BACKGROUND OF THE INVENTION

10 Field of the Invention

[0002] This document relates to a display device, and more particularly, to a display device which prevents penetration of external moisture and oxygen and has an improved lifespan.

15 Discussion of the Related Art

[0003] In recent years, various flat panel displays capable of reducing weight and volume which are demerits of a cathode ray tube have been developed. The flat panel displays include a liquid crystal display (LCD), a field emission display (FED), a plasma display panel (PDP), and an organic light emitting display (OLED).

[0004] Among the above flat panel displays, the organic light emitting display is a self-emissive display device which electrically excites organic compounds and emits light.

The organic light emitting diode does not require a backlight unit, unlike liquid crystal display. Therefore, the organic light emitting display may be fabricated in a lightweight and thin type and by simple processes. In addition, since the organic light emitting display may be fabricated at a low temperature and has characteristics of a fast response speed less than 1 ms, low power consumption, a wide viewing angle, and high contrast.

[0005]The organic light emitting display comprises an emission layer between an anode and a cathode. Thus, holes supplied from the anode combine with electrons supplied from the cathode in the organic emission layer to form hole-electron pairs, i.e., excitons. When the excitons transition from an excited state to a ground state, energy is generated so that the organic light emitting diode emits light.

[0006]FIG. 1 is a cross-sectional view showing a conventional organic light emitting display, and FIG. 2 is a top plan view showing an organic light emitting display which is shrunken.

[0007]Referring to FIG. 1, the conventional organic light emitting display comprises a first electrode 12 formed on a substrate 10, a bank layer 13 formed on the first electrode 12, an organic emission layer 14 formed on the first

electrode 12 exposed by the bank layer 13, and a second electrode 12 formed on the organic emission layer 14. A passivation film 17, which covers the elements disposed below it including the second electrode 15, is formed, and
5 an encapsulation substrate 24 encapsulates the substrate 10 through an encapsulating agent 22.

[0008]Although the above-described conventional organic light emitting display 10 has the passivation film 17 formed on top of the second electrode 15 to protect the
10 elements disposed below it, an impurity 20 with a large diameter may be attached in the fabrication process of the passivation film 17. In this case, external moisture or oxygen penetrates the organic emission layer 14 through a gap in the passivation film 17 that comes off by the
15 impurity 20. As shown in FIG. 2, the organic emission layer 14 has the problem of shrinkage which degrades the organic emission layer 14 by the penetrating moisture and oxygen and causes it to emit no light.

SUMMARY OF THE INVENTION

20 [0009]This invention seeks to provide a display device which prevents or reduces penetration of external moisture and oxygen and has an improved lifespan.

[0010] In one aspect, there is a display device including, a substrate; a first electrode positioned on the substrate; a second electrode; an organic emission layer interposed between the first electrode and the second electrode; an
5 organic insulating film positioned on the second electrode and surrounding an emission area emitting light from the organic emission layer; and a passivation film covering the organic insulating film.

[0011] In another aspect, there is a display device including,
10 a substrate; a first electrode positioned on the substrate; a second electrode; an organic emission layer interposed between the first electrode and the second electrode; a second (lower) passivation film positioned on the second electrode; an organic insulating film positioned on the
15 second electrode and surrounding an emission area emitting light from the organic emission layer; and a first (upper) passivation film covering the second (lower) passivation film and the organic insulating film.

20

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification,

illustrate embodiments of the invention and together with the description serve to explain the principles of the invention. In the drawings:

[0013] FIG. 1 is a cross-sectional view showing a
5 conventional organic light emitting display;

[0014] FIG. 2 is a top plan view showing a related art organic light emitting display which is shrunken;

[0015] FIG. 3 is a cross-sectional view showing a display device according to a first exemplary embodiment of the
10 present invention;

[0016] FIG. 4 is a top plan view showing the display device of FIG. 3;

[0017] FIG. 5 is a cross-sectional view showing the display device according to the first exemplary embodiment of the
15 present invention;

[0018] FIG. 6 is a top plan view showing the display device of FIG. 5;

[0019] FIG. 7 is a cross-sectional view showing a display device according to a second exemplary embodiment of the
20 present invention;

[0020] FIG. 8 is a cross-sectional view showing a display device according to a third exemplary embodiment of the present invention;

[0021] FIG. 9 is a top plan view showing the display device of FIG. 8;

[0022] FIG. 10 is a view showing the left side of a display device with an organic insulating film, and FIG. 11 is a view showing the top side of the display device;

[0023] FIG. 12 is photographs of SEM and AFM measurements conducted on the display devices fabricated according to Comparative Example 2 and Example 2 of the present invention; and

[0024] FIG. 13 is a graph showing the result of analysis of oxygen content in the display devices fabricated according to Comparative Example 2 and Example 2 of the present invention.

15

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0025] Reference will now be made in detail to embodiments of the invention, examples of which are illustrated in the accompanying drawings. The terminology used in the description of the invention herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention.

[0026] FIGS. 3 and 5 are cross-sectional views showing a display device according to a first exemplary embodiment of the present invention. FIG. 4 is a top plan view showing

the display device of FIG. 3. FIG. 6 is a top plan view showing the display device of FIG. 5.

[0027]As shown in FIG. 3, the display device 100 according to the first exemplary embodiment comprises a substrate 110, a first electrode 130 positioned on the substrate 110, a second electrode 136, an organic emission layer 134 interposed between the first electrode 130 and the second electrode 136, a second (lower) passivation film 140 positioned on the second electrode 136, an organic insulating film 170 positioned on the second passivation film 140 and surrounding an emission area EA emitting light from the organic emission layer 134, and a first (upper) passivation film 142 covering the second passivation film 140 and the organic insulating film 170.

[0028]More specifically, a thin film transistor TFT and a capacitor Cst positioned on the substrate 110. The thin film transistor TFT comprises a semiconductor layer 112, a gate electrode 118, a source electrode 126 and a drain electrode 124. A gate insulating film 116 is positioned between the semiconductor layer 112 and the gate electrode 118. An interlayer insulating film 122 is positioned between the gate electrode 118, and the source electrode 126 and the drain electrode 124. The capacitor Cst comprises a capacitor lower electrode 114 and a capacitor

upper electrode 120, with the gate insulating film 126 interposed therebetween.

[0029] Although the first exemplary embodiment of the present invention is illustrated by taking as an example a top-gate type thin film transistor in which the gate electrode 118 is positioned on top of the semiconductor layer 112, the present invention is not limited thereto, but a bottom-gate type thin film transistor in which the gate electrode 118 is positioned below the semiconductor layer 112 is also applicable.

[0030] An overcoat layer 124 is positioned on the substrate 110 where the thin film transistor TFT and the capacitor Cst are formed. The overcoat layer 124 protects the thin film transistor TFT and the capacitor Cst, and planarizes steps formed by the thin film transistor TFT.

[0031] The first electrode 130 is positioned on the overcoat layer 124. The first electrode 130 is an anode, which may be made of a transparent conductive material having a high work function and causing light to be transmitted therethrough, such as indium tin oxide (ITO), indium zinc oxide (IZO), indium cerium oxide (ICO), or zinc oxide (ZnO). The first electrode 130 is electrically connected to the drain electrode 124 of the thin film transistor TFT through a via hole 126 penetrating through the overcoat layer 124

exposing the drain electrode 124 of the thin film transistor TFT.

5 [0032]The bank layer 132 is positioned on the first electrode 130. The bank layer 132 may be a pixel defining film that exposes part of the first electrode 130 and defines a pixel. The organic emission layer 134 is positioned on the bank layer 132 and the exposed first electrode 130. The organic emission layer 134 is a layer which emits light by recombination of electrons and holes.

10 A hole injection layer or hole transport layer may be included between the organic emission layer 134 and the first electrode 130, and an electron transport layer or electron injection layer may be included on the organic emission layer 134.

15 [0033]The second electrode 136 is positioned on the substrate 110 where the organic emission layer 134 is formed. The second electrode 136 is a cathode made of magnesium Mg, calcium, Ca, aluminum Al, silver Ag, or an alloy thereof, which has a low work function.

20 [0034]The display device according to the exemplary embodiment of the present invention may be a bottom-emission type in which light is emitted from the organic emission layer 134 in the direction of the substrate 110 or a top-emission type in which light is emitted from the

organic emission layer 134 in the direction of the second electrode 136. The bottom-emission type display device is configured such that the first electrode 130 transmits light and the second electrode 136 has a thickness large enough to reflect light. On the other hand, the top-emission type is configured such that the first electrode 130 comprises a reflection layer made of aluminum Al, silver Ag, or nickel Ni and the second electrode 136 has a thickness small enough to cause light to be transmitted therethrough; preferably, a thickness of 1 to 50Å.

[0035]The second passivation film 140 covering the top of the second electrode 136 is positioned on the substrate 110 where the second electrode 136 is formed. Covering the top of the second electrode 136 refers to forming the second passivation film 140 along the step coverage of the second electrode 136. The second passivation film 140 functions to protect the elements disposed therebelow and prevent moisture from penetrating the organic emission layer 134, is made of at least one selected from the group consisting of a silicon nitride film, a silicon oxide film, and aluminum oxide, and has a single-layered or multi-layered structure thereof.

[0036]The organic insulating layer 170 is positioned on the second passivation film 140. As show in FIG. 4, the

organic insulating film 170 is formed at a periphery of the emission area EA in such a shape as to surround the emission area EA. The emission area EA is an area in which light of the organic emission layer 134 is emitted through RGB subpixels to display an image. The organic insulating film 170 is positioned in a peripheral area other than the emission area EA, and prevents degradation of the transmittance of light emitted from the emission area EA. The organic insulating film 170 may be made of, but not limited to, an epoxy type monomer which has an excellent effect of preventing moisture or oxygen, and may be made of at least one selected from the group consisting of epoxy type, siloxane type, acrylic type, urethane type monomers, and combinations thereof.

15 [0037]The width w of the organic insulating film 170 surrounding the emission area EA of the display device 100 ranges from 1 to 30 mm. If the width w of the organic insulating film 170 is equal to or greater than 1 mm, moisture and oxygen penetrating from the outside of the display device 100 can be prevented. If the width w of the organic insulating film 170 is equal to or less than 30 mm, a bezel of the display device 100 can be prevented from being widened by the organic insulating film 170.

[0038] The thickness of the organic insulating film 170 ranges from 0.5 to 200 μ m. If the thickness of the organic insulation film 170 is equal to greater than 0.5 μ m, the organic insulating film 170 fills a gap in the second passivation film 140 caused by an impurity, and hence the second passivation film 14, which is to be formed later, is made uniform, thereby preventing penetration of moisture or oxygen. If the thickness of the organic insulating film 170 is equal to or greater than 200 μ m, this prevents an increase in the processing time of the organic insulating film 170 and an increase in material costs.

[0039] As previously shown in FIG. 1, if a gap caused by an impurity is generated in an inorganic film, such as the second passivation film 140 or the second electrode 136, below the organic insulating film 170, the organic insulating film 170 in liquid form fills the gap and hence makes the second passivation film 140 uniform, thereby preventing penetration of moisture or oxygen. Also, the organic insulating film 170 is formed in such a shape as to surround the emission area EA of the display device 100, and hence acts like a dam for preventing moisture and oxygen penetrating from the outside of the display device 100.

[0040]The first passivation film 142 covering the organic insulating film 170 and the second passivation film 140 is positioned on the organic insulating film 170 and the second passivation film 140. The first passivation film 5 142 is made of the same material as the above-mentioned second passivation film 2, and capable of protecting the elements disposed therebelow and preventing penetration of oxygen and moisture from the outside.

[0041]The encapsulation substrate 160 is bonded onto the 10 substrate 110 with the first passivation film 142 by a filling sealant. The filling sealant 165 serves to adhere the substrate 110 and the encapsulation substrate 160 to protect the elements disposed therein. The filling sealant 165 may be a material which has excellent adhesion 15 characteristic and excellent light transmittance. For example, the filling sealant 185 may be made of a thermosetting or ultraviolet curing material, or may be made of epoxy type, acrylic type, imide type, or silane type material.

20 [0042]As above, the display device of embodiments of the present invention has the advantage of preventing or reducing moisture and oxygen penetrating from the outside of the display device by forming an organic insulating film surrounding the emission area, and preventing penetration

of moisture or oxygen as a gap caused by an impurity is filled with the organic insulating film to thus make the second passivation film uniform.

[0043]As shown in FIGS. 5 and 6, the display device according to the first exemplary embodiment of the present invention is configured such that the organic insulating film 170 covers part of the emission area EA. As show in FIG. 6, the organic insulating film 170 has a large width w so as to cover even the inside of the emission area EA. The larger the width w of the organic insulating film 170, the higher the effect of preventing moisture and oxygen penetrating from the outside. However, as the width w of the organic insulating film 170 becomes larger, the bezel of the display device becomes greater. Thus, in this exemplary embodiment, the organic insulating film 170 is formed to cover part of the emission area EA. Preferably, the organic insulating film 170 is formed to cover as small part of the emission area EA as possible so as not to degrade the transmittance of light emitted from the organic emission layer 134.

[0044]FIG. 7 is a cross-sectional view showing a display device according to a second exemplary embodiment of the present invention. In the following, the same components as those in the first exemplary embodiment are denoted by

the same reference numerals, and description thereof are omitted.

[0045]As shown in FIG. 7, the display device according to the second exemplary embodiment comprises a substrate 110, a first electrode 130 positioned on the substrate 110, a second electrode 136, an organic emission layer 134 interposed between the first electrode 130 and the second electrode 136, an organic insulating film 170 positioned on the second electrode 136 and surrounding an emission area EA emitting light from the organic emission layer 134, and a first passivation film 142 covering the organic insulating film 170.

[0046]In particular, in the second exemplary embodiment of the present invention, the organic insulating film 170 contacting the second electrode 136 is formed on the second electrode 136, and the first passivation film 142 covering the organic insulating film 170 is formed. In the second exemplary embodiment of the present invention, the second passivation film of the previous first exemplary embodiment is omitted. Omitting the second passivation film has the advantage of improving the transmittance of light emitted from the organic emission layer 134, and helps to maintain the effect of preventing moisture and oxygen. Also, The display device according to the second exemplary embodiment

of the present invention may be configured such that the organic insulating film 170 covers part of the emission area EA or not.

[0047] In the display device according to the second exemplary embodiment of the present invention, when an impurity is generated after the fabrication process of the second electrode 136, the organic insulating film 170 fills a gap caused by an impurity, and hence the first passivation film 142, which is to be formed later, is made uniform. Accordingly, the first passivation film 142 can be improved in the effect of preventing moisture and oxygen penetration.

[0048] FIG. 8 is a cross-sectional view showing a display device according to a third exemplary embodiment of the present invention. FIG. 9 is a top plan view showing the display device of FIG. 8. In the following, the same components as those in the first exemplary embodiment are denoted by the same reference numerals, and description thereof are omitted.

[0049] As shown in FIG. 8, the display device according to the third exemplary embodiment comprises a substrate 110, a first electrode 130 positioned on the substrate 110, a second electrode 136, an organic emission layer 134 interposed between the first electrode 130 and the second

electrode 136, and a second (lower) passivation film 140 covering the second electrode 136.

[0050] In the third exemplary embodiment of the present invention, an organic insulating film 170 is positioned on the second passivation film 140. Unlike the previous first and second exemplary embodiments, the organic insulating film 170 is formed to cover an emission area EA emitting light. The organic insulating film 170 acts as an adhesion layer between the first (upper) passivation film 142 and the second passivation film 140 to thereby ensure the high-temperature and high-humidity reliability of the device.

[0051] A first passivation film 142 covering the organic insulating film 170 and the second passivation film 140 is positioned on the organic insulating film 170. The first passivation film 142 is made of the same material has the above-mentioned second passivation film 140, and capable of protecting the elements disposed therebelow and preventing penetration of oxygen and moisture from the outside.

[0052] The display device according to the third exemplary embodiment of the present invention further comprises a metal oxide film 150 formed between the first passivation film 142 and the second passivation film 140. More particularly, the metal oxide film 150 is formed on an interface on which the first passivation film 142 and the

second passivation film 140 face each other. That is, the metal oxide film 150 contacting the first passivation film 142 is formed on the first passivation film 142, and the second passivation film 140 contacting the metal oxide film 150 is formed on the metal oxide film 150.

[0053]The metal oxide film 150 serves to buffer the unstable interface between the first passivation film 142 and the second passivation film 140. The first passivation film 142 and the second passivation film 140 are formed by a chemical vapor deposition method using plasma, such as PECVD. In the present invention, the second passivation film 140 is firstly formed by PECVD, the organic insulating film 170 is then formed in another chamber, and the first passivation film 142 is then formed by PECVD. Therefore, the interfacial characteristics between the first passivation film 142 and the second passivation film 140 are not good due to a discontinuous plasma process.

[0054]In the present invention, the metal oxide film 150 is formed on the second passivation film 140, which is to be in contact with the first passivation film 142, after the second passivation film 140 and the organic insulating film 170 are formed. The metal oxide film 150 is made of a metal oxide, such as an aluminum oxide, a magnesium oxide, or indium tin oxide, and is formed by a low-temperature

film formation process such as sputtering, chemical vapor deposition, atomic layer deposition, facing target sputtering, etc. The metal oxide film 150 is formed with a thickness of 500 to 2000 μ m, and buffers the interface
5 between the first passivation film 142 and the second passivation film 140.

[0055]As shown in FIG. 9, the metal oxide film 150 is formed to surround the emission area EA emitting light from the organic emission layer 134, and is also formed in an area
10 other than the emission area EA so as not to block the light emitted from the organic emission layer 134. An encapsulation substrate 160 is bonded onto the substrate 110 with the first passivation film 142 by a filling sealant.

15 [0056]As seen from above, the display device according to the third exemplary embodiment of the present invention can prevent defects such as bubbles, which may be generated between the first passivation film and the second passivation film, by forming a metal oxide film between the
20 first passivation film and the second passivation film. Accordingly, there is the advantage of preventing moisture and oxygen penetrating from the outside of the display device by means of the interface between the first passivation film and the second passivation film.

[0057] Hereinafter, exemplary experimental examples will be disclosed to help understanding of the present invention. However, the exemplary examples are merely to explain the present invention, and not to limit the scope of the present invention.

[0058] <Exemplary Experimental Example 1>

[0059] Comparative Example 1

[0060] A display device having the above-described structure of FIG. 1 was fabricated. A passivation film was formed of a single-layered silicon nitride film with a thickness of 0.5 μ m.

[0061] Example 1

[0062] A display device having the above-described structure of FIG. 5 was fabricated. A first passivation film was formed of a silicon nitride film with a thickness of 0.5 μ m, and a second passivation film was formed of a silicon nitride film with a thickness of 1.5 μ m. As shown in FIGS. 10 and 11, the thus-formed display device of the example was configured such that an organic insulating film (indicated by dotted line) covers part of an emission area where a plurality of pixels were formed.

[0063] A reliability test was conducted on the display devices fabricated according to Comparative Example 1 and Example 1, and the results were shown in the following

Table 1. In the following reliability test, 30 panels were prepared for each of Comparative Example 1 and Example 1, and neglected for 100, 200, 300, 400, and 500 hours in an atmosphere of a temperature of 85°C and a humidity of 85%.

5 [0064] [Table 1]

hours	Number of operating panels (rate % of non-defective products)	
	Comparative Example	Example
500	0	17 (56%)
400	0	19
300	0	19
200	0	20
100	2 (6%)	24

[0065] As shown in Table 1, in the display device according to Comparative Example 1 of the present invention, there was no panel at all that operated normally when the reliability test was conducted for 200, 300, 400, and 500 hours, and two panels operated normally when the reliability test was conducted for 100 hours. On the contrary, in the display device according to Example 1 of the present invention, it was confirmed that a minimum of 17 panels operated normally for each time range.

15 [0066] <Exemplary Experimental Example 2>

[0067] Comparative Example 2

[0068] A display device having the above-described structure of FIG. 8 was fabricated. A first passivation film was formed of a silicon nitride film with a thickness of 0.5µm, an organic insulating film was formed of epoxy resin with a

thickness of 10 μ m, and a second passivation film was formed of a silicon nitride film with a thickness of 1.5 μ m. And, a metal oxide film was formed of an aluminum oxide film with a thickness of 500 μ m.

5 [0069]Comparative Example 2

[0070]A display device was fabricated without forming a metal oxide film under the same condition as the foregoing Example 2.

[0071]SEM and AFM measurement photographs of the display
10 devices fabricated according to the foregoing Comparative Example 2 and Example 2 were shown in FIG. 12, and the result of analysis of oxygen content in the display devices fabricated according to Comparative Example 2 and Example 2 using a ToF-SIMS depth profile was shown in FIG. 13.

15 [0072]As shown in FIGS. 12 and 13, it was confirmed that the first passivation film and second passivation film with no metal oxide film according to Comparative Example 2 showed low surface roughness and high oxygen content was observed on the interface where the first passivation film and the
20 second passivation film contact each other. On the contrary, it was confirmed that the first passivation film and second passivation film with a metal oxide film formed therebetween according to Example 2 show good surface roughness and the oxygen content was significantly reduced

in an area where the first passivation film and the second passivation film face each other.

[0073]As seen from above, the display devices according to the exemplary embodiments of the present invention can prevent moisture and oxygen penetrating from the outside of the display devices by forming an organic insulating film surrounding an emission area, and prevent penetration of moisture or oxygen because the organic insulating fills a gap caused by an impurity and hence makes passivation film uniform.

[0074]Moreover, the display devices according to the exemplary embodiments of the present invention can prevent defects such as bubbles, which may be generated between the first passivation film and the second passivation film, by forming a metal oxide film between the first passivation film and the second passivation film. Accordingly, there is the advantage of preventing moisture and oxygen penetrating from the outside of the display devices by means of the interface between the first passivation film and the second passivation film.

[0075]Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art

that will fall within the spirit and scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

10

CLAIMS:

1. A display device comprising:

a substrate;

5 a first electrode positioned on the substrate;

a second electrode;

an organic emission layer interposed between the first
electrode and the second electrode;

10 an organic insulating film positioned on the second
electrode and surrounding an emission area for emitting
light from the organic emission layer; and

a passivation film covering the organic insulating
film.

15 2. A display device according to claim 1, wherein the
organic insulating film is formed in an area other than the
emission area.

20 3. A display device according to claim 1, wherein the
organic insulating film is formed to cover part of the
emission area.

4. A display device according to any preceding claim,
wherein the width of the organic insulating film ranges
from 1 to 30 mm.

5 5. A display device according to any preceding claim,
wherein the thickness of the organic insulating film ranges
from 0.5 to 200 μ m.

6. A display device according to any preceding claim,
10 wherein the organic insulating film is made of at least one
selected from the group consisting of epoxy type, siloxane
type, acrylic type, urethane type monomers, and
combinations thereof.

15 7. A display device according to any preceding claim,
further comprising an encapsulation substrate bonded to the
substrate,

wherein a filling agent is formed between the
substrate and the encapsulation substrate to thus bond the
20 substrate and the encapsulation substrate together.

8. A display device according to any preceding claim,
wherein the passivation film is made of at least one

selected from the group consisting of a silicon nitride film, a silicon oxide film, and aluminum oxide.

9. A display device comprising:

5

a substrate;

a first electrode positioned on the substrate;

a second electrode;

an organic emission layer interposed between the first electrode and the second electrode;

10

a second passivation film positioned on the second electrode;

an organic insulating film positioned on the second electrode and surrounding an emission area for emitting light from the organic emission layer; and

15

a first passivation film covering the second passivation film and the organic insulating film.

10. A display device according to claim 9, wherein the organic insulating film is formed in an area other than the
20 emission area.

11. A display device according to claim 9, wherein the organic insulating film is formed to cover part of the emission area.

12. A display device according to any of claims 9 to 11, wherein the width of the organic insulating film ranges from 1 to 30 mm.

5

13. A display device according to any of claims 9 to 12, wherein the thickness of the organic insulating film ranges from 0.5 to 200 μ m.

10

14. A display device according to any of claims 9 to 13, wherein the organic insulating film is made of at least one selected from the group consisting of epoxy type, siloxane type, acrylic type, urethane type monomers, and combinations thereof.

15

15. A display device according to any of claims 9 to 14, further comprising an encapsulation substrate bonded to the substrate,

20 wherein a filling agent is formed between the substrate and the encapsulation substrate to thus bond the substrate and the encapsulation substrate together.

16. A display device according to any of claims 9 to 15, wherein the first passivation film and the second

passivation film are made of at least one selected from the group consisting of a silicon nitride film, a silicon oxide film, and aluminum oxide.

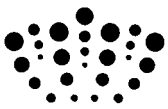
5 17. A display device according to any of claims 9 to 16, further comprising a metal oxide film positioned between the first passivation film and the second passivation film.

10 18. A display device of claim 17, wherein an area between the first passivation film and the second passivation film corresponds to an area surrounding the emission area.

15 19. A display device according to claim 17 or 18, wherein the metal oxide film contacting the first passivation film is positioned on the first passivation film, and the second passivation film contacting the metal oxide film is positioned on the metal oxide film.

20 20. A display device according to claim 19, wherein the organic insulating film is formed to cover the emission area.

21. A display device, substantially as hereinbefore described with reference to any of Figures 3 to 6, 7, 8 to 10 or 11 or 12 of the accompanying drawings.



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Claims searched: 1-21

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Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	--	US2005/218396 A1 (TSUCHIYA) - See figures and abstract at least.
A	--	US2010/213828 A1 (SEO) - See abstract, figure 3 and paragraphs [0043]-[0076].
A	--	US2003/034497 A1 (YAMAZAKI) - See figure 1B-1C & 3A-3B and paragraphs [0095]-[0117].
A	--	US2011/156062 A1 (KIM) - See figure 2 and paragraph [0050] at least.

Categories:

X Document indicating lack of novelty or inventive step	A Document indicating technological background and/or state of the art.
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Worldwide search of patent documents classified in the following areas of the IPC

G02F; G09G; H01L

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI.

International Classification:

Subclass	Subgroup	Valid From
H01L	0051/52	01/01/2006