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(71) Applicant: **Samsung SDI Co., Ltd.**
Suwon-city,
Kyungki-do 442-390 (KR)

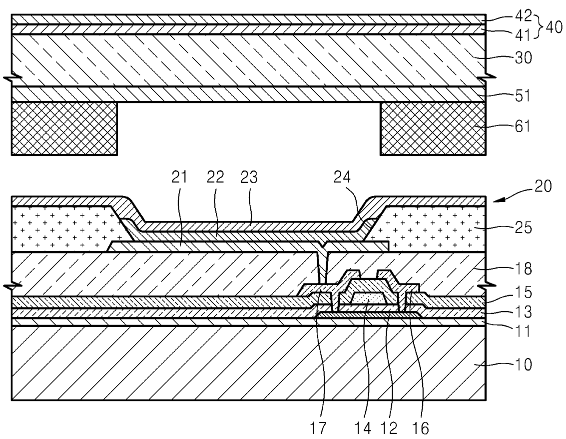
(72) Inventors:
- **Cho, Yoon-Hyeung**
  c/o Legal & IP Team
  Yeongtong-gu, Suwon-si, Gyeonggi-do (KR)
- **Lee, Byoung-Duk**
  c/o Legal & IP Team
  Yeongtong-gu, Suwon-si, Gyeonggi-do (KR)
- **Oh, Min-Ho**
  c/o Legal & IP Team
  Yeongtong-gu, Suwon-si, Gyeonggi-do (KR)
- **Lee, So-Young**
  c/o Legal & IP Team
  Yeongtong-gu, Suwon-si, Gyeonggi-do (KR)
- **Lee, Sun-Young**
  c/o Legal & IP Team
  Yeongtong-gu, Suwon-si, Gyeonggi-do (KR)
- **Kim, Won-Jong**
  c/o Legal & IP Team
  Yeongtong-gu, Suwon-si, Gyeonggi-do (KR)
- **Choi, Jin-Baek**
  c/o Legal & IP Team
  Yeongtong-gu, Suwon-si, Gyeonggi-do (KR)
- **Lee, Jong-Hyuk**
  c/o Legal & IP Team
  Yeongtong-gu, Suwon-si, Gyeonggi-do (KR)
- **Kim, Yong-Tak**
  c/o Legal & IP Team
  Yeongtong-gu, Suwon-si, Gyeonggi-do (KR)

(74) Representative: **Perkins, Dawn Elizabeth et al**
Venner Shipley LLP
20 Little Britain
London EC1A 7DH (GB)

(54) **Organic light emitting display device**

(57) Provided is an organic light emitting display device that has an increased contrast and impact resistance. The organic light emitting device includes a substrate (10); an organic light emitting device (20) disposed on the substrate to display images; a sealing member (30) formed above the organic light emitting device; a selective light absorbing layer (51) that is formed on the surface of the sealing member that faces the organic light emitting device and comprises pigments that selectively absorb light; and a black matrix layer (61) formed on the selective light absorbing layer to correspond to non-emission areas of the organic light emitting device.

FIG. 1



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Description

[0001] The present invention relates to an organic light emitting display device, and more particularly, to an organic light emitting display device that has an increased contrast and impact resistance.

[0002] The recent trend of display apparatuses is for the display apparatuses to be thin and mobile. Of the flat panel display apparatuses, organic and inorganic organic light emitting display apparatuses are expected to be the next generation of display apparatuses due to their advantages which are that the organic and inorganic organic light emitting display apparatuses are emissive type display apparatuses and have a wide viewing angle, high contrast, and a short response time. Also, organic light emitting display devices in which a light emitting layer is formed of an organic material have advantages over inorganic light emitting display devices in that the organic light emitting display devices have higher brightness, lower driving voltage, short response time, and can be multi-colored.

[0003] Flat panel display devices are formed to be lightweight and slim so that the flat panel display devices can be mobile and can be used outdoors. However, when images are viewed outdoors, contrast and visibility of the images displayed on the flat panel display devices can be reduced due to strong external light such as sunlight. Even indoors, the visibility of the images displayed on the flat panel display apparatus can be reduced due to fluorescent lamps.

[0004] Therefore, in order to prevent the reduction of visibility of images due to external light, a film type polarized plate is attached to the entire surface of the conventional flat panel display device. In this way, the reflection of external light that enters into the flat panel display apparatus is prevented. As a result, brightness of the reflected external light is reduced, and thus, the reduction of visibility of an image due to external light is prevented.

[0005] However, in the case of such a conventional flat panel display device, the film type polarized plate attached to the entire surface of the flat panel display device is manufactured by bonding many layers of films. Thus, the manufacturing process is complicated which leads to high manufacturing costs, and due to an increased thickness of the flat panel display device, a thin flat panel display device cannot be realized. Accordingly, there is a need to develop a method to increase contrast of the organic light emitting display device without using a circular polarized film and also to prevent the organic light emitting display device from being damaged by external impact.

[0006] The present invention provides an organic light emitting display device that has an increased contrast and impact resistance.

[0007] According to an aspect of the present invention, there is provided an organic light emitting display device comprising: a substrate; an organic light emitting device disposed on the substrate to display images; a sealing member formed above the organic light emitting device; a selective light absorbing layer that is formed on one of the both surfaces of the sealing member that faces the organic light emitting device and comprises pigments that selectively absorb light; and a black matrix layer formed on the selective light absorbing layer to correspond to non-emission areas of the organic light emitting device.

[0008] The organic light emitting device may comprise a first electrode, a pixel define layer in which an opening is formed to expose the first electrode, an organic light emitting layer formed on the first electrode which is exposed by the opening, and a second electrode formed on the organic light emitting layer, wherein the black matrix layer is formed on the selective light absorbing layer to correspond to the pixel define layer of the organic light emitting device.

[0009] According to another aspect of the present invention, there is provided an organic light emitting display device comprising: a substrate; an organic light emitting device disposed on the substrate to display images; a sealing member formed above the organic light emitting device; a black matrix layer formed on one of both surfaces of the sealing member facing the organic light emitting device to correspond to non-emission areas of the organic light emitting device; and a selective light absorbing layer that covers the black matrix layer, is formed on one of the both surfaces of the sealing member facing the organic light emitting device, and comprises pigments that selectively absorb light.

[0010] The organic light emitting device may comprise a first electrode, a pixel define layer in which an opening is formed to expose the first electrode, an organic light emitting layer formed on the first electrode on which the opening is formed, and a second electrode formed on the organic light emitting layer, wherein the black matrix layer is formed on one of the both surfaces of the sealing member facing the organic light emitting device to correspond to the pixel define layer of the organic light emitting device.

[0011] According to another aspect of the present invention, there is provided an organic light emitting display device comprising: a substrate; an organic light emitting device disposed on the substrate to display images; a sealing member formed above the organic light emitting device; a black matrix layer formed on the surface of the sealing member that faces the organic light emitting device to correspond to non-emission areas of the organic light emitting device; and a selective light absorbing layer that covers the black matrix layer and is formed on a surface of the sealing member that faces the organic light emitting device in areas between the black matrix layers, and comprises pigments that selectively absorb light.

[0012] The organic light emitting device may comprise a first electrode, a pixel define layer in which an opening is formed to expose the first electrode, an organic light emitting layer formed on the first electrode which is exposed by the opening, and a second electrode formed on the organic light emitting layer, wherein the black matrix layer is formed on one of the both surfaces of the sealing member that faces the organic light emitting device to correspond to the pixel define layer of the organic light emitting device.

[0013] The selective light absorbing layer may comprise a red pigment and a blue pigment.

[0014] The selective light absorbing layer may have an optical transmittance of 10 to 90% in a wavelength of 550 nm.

[0015] The black matrix layers may have a thickness of 5 to 20 μm.

[0016] The black matrix layers may comprise a material selected from the group consisting of carbon black particles or graphite.

[0017] The organic light emitting display device may further comprise a reflection preventive layer formed on one of both surfaces of the sealing member.

[0018] The reflection preventive layer may comprise a semi-transparent film that transmits some of external light and reflects the rest of the external light and a protective film covering the semi-transparent film, and the semi-transparent film may have a refractive index greater than that of the protective film.

[0019] The protective film may comprise a thermosetting resin, urethane acrylate, or epoxy resin.

[0020] The semi-transparent film may have an optical transmittance of 40 to 80%.

[0021] The semi-transparent film may have a refractive index of 1.5 to 5.

[0022] The semi-transparent film may be formed of a metal colloid and may comprise Au, Ag, or Ti.

[0023] The above and other features and advantages of the present invention will become more apparent by describing in detail exemplary embodiments thereof with reference to the attached drawings in which:

FIG. 1 is a schematic cross-sectional view illustrating an organic light emitting display device according to an embodiment of the present invention;

FIG. 2 is a graph showing an optical transmittance of a conventional circular polarized film in each wavelength and an optical transmittance of a selective light absorbing layer that includes blue and red pigments according to an embodiment of the present invention;

FIG. 3 is a schematic cross-sectional view illustrating an organic light emitting display device according to another embodiment of the present invention; and

FIG. 4 is a schematic cross-sectional view illustrating an organic light emitting display device according to another embodiment of the present invention.

[0024] The present invention will now be described more fully with reference to the accompanying drawings in which exemplary embodiments of the invention are shown.

[0025] FIG. 1 is a schematic cross-sectional view illustrating an organic light emitting display device according to an embodiment of the present invention.

[0026] Organic light emitting display devices can largely be divided into active matrix (AM) type organic light emitting display devices and passive matrix (PM) type organic light emitting display devices. In FIG. 1, an AM type organic light emitting display device is shown. However, the present invention is not limited thereto, that is, the present invention can be applied to PM type organic light emitting display devices.

[0027] Referring to FIG. 1, the organic light emitting display device according to an embodiment of the present invention includes a substrate 10, an organic light emitting device 20, a sealing member 30, a reflection preventive film 40, a selective light absorbing layer 51, and a black matrix layer 61.

[0028] The substrate 10 can be formed of a transparent glass material that contains SiO_2 as a main component. However, the substrate 10 is not limited thereto, and can be formed of a transparent plastic material. In the case of a bottom emission type organic light emitting display device in which images are displayed by emitting light through the substrate 10, the substrate 10 must be formed of a transparent material. However, as depicted in FIG. 1, in the case of a top emission type organic light emitting display device in which images are displayed by emitting light through the sealing member 30, it is not necessary for the substrate 10 to be formed of a transparent material.

[0029] A buffer layer 11 can further be formed on the substrate 10 to be planar with the substrate 10 and to prevent the penetration of impure elements using SiO_2 and/or SiN_x.

[0030] A thin film transistor (TFT) is formed on an upper surface of the substrate 10. The TFT is formed at least one in each pixel, and is electrically connected to the organic light emitting device 20.

[0031] A semiconductor layer 12 is formed in a predetermined pattern on the buffer layer 11. The semiconductor layer 12 can be formed of an inorganic semiconductor such as amorphous silicon or poly silicon or an organic semiconductor, and includes a source region, a drain region, and a channel region.

[0032] A gate insulating film 13 is formed on the semiconductor layer 12 using SiO_2 or SiN_x, and a gate electrode 14 is formed in a predetermined region of the gate insulating film 13. The gate electrode 14 is connected to a gate line (not shown) that applies ON/OFF signals to the TFT.

[0033] An interlayer insulating layer 15 is formed on the resultant structure to cover the gate electrode 14. A source electrode 16 and a drain electrode 17 are respectively connected to the source region and the drain region of the semiconductor layer 12. The TFT formed in this way is covered by a passivation film 18.

[0034] The passivation film 18 can be an inorganic insulating film and/or an organic insulating film. The inorganic insulating film can be formed of SiO_2, SiNx, SiON, Al_2O_3, TiO_2, Ta_2O_5, HfO_2, ZrO_2, BST, or PZT, and the organic insulating film can be formed of an ordinary polymer such as poly methylmethacrylate (PMMA) or a polystyrene copolymer that includes polystyrene (PS), a polymer derivative having phenol group, an acryl group polymer, an imide group polymer, an ether group polymer, an amide group polymer, a fluoride group polymer, a p-gilyrene group polymer, a vinyl alcohol group polymer, or a blend of these materials. Also, the passivation film 18 can be formed in a composite stack of an inorganic insulating film and an organic insulating film.

[0035] A first electrode 21 that acts as an anode electrode of the organic light emitting device 20 is formed on the passivation film 18, and a pixel define layer 25 covering the first electrode 21 is formed using an insulating material.

[0036] After a predetermined opening 24 is formed in the pixel define layer 25, an organic light emitting layer 22 of the organic light emitting device 20 is formed in a region defined by the opening 24. Afterwards, a second electrode 23 that acts as a cathode electrode of the organic light emitting device 20 is formed to cover all pixels. The polarity of the first electrode 21 and the second electrode 23 may be reversed.

[0037] The organic light emitting device 20 displays images using light generated according to the flow of current, and includes the first electrode 21 electrically connected to the drain electrode 17 of the TFT through a contact hole, the organic light emitting layer 22, and the second electrode 23.

[0038] The first electrode 21 can be formed in a predetermined pattern using a photolithography method. In the case of a PM type organic light emitting display device, the pattern of the first electrode 21 can be formed to be stripe shapes separated a predetermined distance from each other. In the case of an AM type organic light emitting display device, the first electrode 21 can be formed in a shape corresponding to the pixels.

[0039] The second electrode 23 is formed above the first electrode 21, and can act as a cathode electrode by being connected to an external terminal (not shown). In the case of a PM type organic light emitting display device, the second electrode 23 can be formed in a stripe shape perpendicularly crossing the pattern of the first electrode 21. In the case of an AM type organic light emitting display device, the second electrode 23 can be formed over the entire active region where images are displayed. The polarity of the first electrode 21 and the second electrode 23 may be reversed.

[0040] In the case of a bottom emission type organic light emitting display device in which images are displayed through the substrate 10, the first electrode 21 can be a transparent electrode and the second electrode 23 can be a reflection electrode. In such case, the first electrode 21 can be formed of a material having high work function such as ITO, IZO, ZnO, or In_2O_3, and the second electrode 23 can be formed of a metal having low work function such as Ag, Mg, Al, Pt, Pd, Au, Ni, Nd, Ir, Cr, Li, or Ca.

[0041] As depicted in FIG. 1, in the case of a top emission type organic light emitting display device in which images are displayed through the second electrode 23, the first electrode 21 can be a reflection electrode and the second electrode 23 can be a transparent electrode.

[0042] In such case, the reflection electrode that acts as the first electrode 21 can be formed such that, after a reflection film is formed using a metal such as Ag, Mg, Al, Pt, Pd, Au, Ni, Nd, Ir, Cr, Li, Ca, or a compound of these metals, a material having a high work function such as ITO, IZO, ZnO, or In_2O_3 is deposited on the reflection film. The transparent electrode that acts as the second electrode 23 can be formed such that, after depositing a metal having a low work function such as Ag, Mg, Al, Pt, Pd, Au, Ni, Nd, Ir, Cr, Li, Ca, or a compound of these metals, an auxiliary electrode layer or a bus electrode line can be formed on the metal deposition using a transparent conductive material such as ITO, IZO, ZnO, or In_2O_3.

[0043] In the case of a dual sided emission type organic light emitting display device, both of the first electrode 21 and the second electrode 23 can be formed to be transparent electrodes.

[0044] The organic light emitting layer 22 interposed between the first electrode 21 and the second electrode 23 emits light by the electrical driving of the first electrode 21 and the second electrode 23. The organic light emitting layer 22 can be formed of a low molecular weight organic material or a polymer organic material.

[0045] If the organic light emitting layer 22 is formed of a low molecular weight organic material, a hole transport layer (HTL) and a hole injection layer (HIL) are stacked in a direction from the organic light emitting layer 22 towards the first electrode 21, and an electron transport layer (ETL) and an electron injection layer (EIL) are stacked in a direction from the organic light emitting layer 22 towards the second electrode 23. Beside the above, various layers can be stacked, if necessary. The organic light emitting layer 22 can be formed of various materials including copper phthalocyanine (CuPc), N,N'-Di(naphthalene-1-yl)-N,N'-diphenyl-benzidine (NPB), and tris-8-hydroxyquinoline aluminium (Alq3).

[0046] If the organic light emitting layer 22 is formed of a polymer organic material, only an HTL is included in a direction from the organic light emitting layer 22 towards the first electrode 21. The HTL is formed on the first electrode 21 using poly-(2,4)-ethylene-dihydroxy thiophene (PEDOT) or polyaniline (PANI) by an inkjet printing method or a spin coating method. The polymer organic light emitting layer 22 can be formed of poly-phenylenevinylene (PPV), soluble PPV's, cyano-PPV, or polyfluorene, and a color pattern of the polymer organic light emitting layer 22 can be formed using a spin coating, an inkjet printing, or a thermal transcribing method.

[0047] The sealing member 30 that encapsulates the organic light emitting device 20 is formed on the organic light emitting device 20. The sealing member 30 protects the organic light emitting device 20 from external moisture or oxygen. In a top emission type organic light emitting display device as depicted in FIG. 1, the sealing member 30 is formed of a transparent material such as glass or plastic.

[0048] A semi-transparent film 41 that reflects some external light and transmits the rest of the external light is formed above the sealing member 30. The semi-transparent film 41 may have a refractive index of 1.5 to 5.

[0049] The semi-transparent film 41 can be formed in a metal colloid shape using Ag, Au, or Ti. The semi-transparent film 41 can be readily formed through an annealing process after coating a film using a dip coating or a bar coating.

[0050] The semi-transparent film 41 can be formed to have an optical transmittance of 40 to 80% by controlling a thickness of the semi-transparent film 41 or by controlling process conditions for forming the metal colloid.

[0051] The semi-transparent film 41 can be formed to a thickness of 10 nm to 10 μm. If the semi-transparent film 41 is too thick, the transmittance of the semi-transparent film 41 is reduced resulting in the reduction of optical efficiency of light generated from the organic light emitting device 20, and thus, the semi-transparent film 41 is formed to a thickness of 10 μm or less. If the semi-transparent film 41 is too thin, the transmittance of the semi-transparent film 41 excessively increases.

Accordingly, an amount of external light that passes through the semi-transparent film 41 increases, and thus, the reflection of external light increases.

[0052] A protective film 42 having a refractive index smaller than that of the semi-transparent film 41 is formed on the semi-transparent film 41.

[0053] The protective film 42 can be formed of a thermosetting resin having high impact resistance, such as urethane acrylate or epoxy resin. The protective film 42 is transparent. The protective film 42 can be formed such that, after coating a film using a spin coating method, a dip coating method, or a bar coating method, the film is annealed or hardened by ultraviolet (UV) rays.

[0054] The protective film 42 can be formed to a thickness of 10 nm to 30 μm. In order to ensure impact resistance, the protective film 42 is formed to a thickness of 10 nm or more. However, if the thickness of the protective film 42 is excessively thick, an overall thickness of the organic light emitting display device increases. Therefore, the protective film 42 is formed to a thickness of 30 μm or less.

[0055] The protective film 42 is formed of a thermosetting resin having high impact resistance to prevent the semi-transparent film 41 from external impact.

[0056] In FIG. 1, since the semi-transparent film 41 covers the protective film 42 on the sealing member 30 and the semi-transparent film 41 has a refractive index greater than that of the protective film 42, interfacial reflection of external light can be prevented. Accordingly, a combination of the semi-transparent film 41 and the protective film 42 can perform the function of a conventional circular polarized plate. In particular, since the transmittance of the semi-transparent film 41 is 40 to 80% and the protective film 42 is transparent, it is easy to maintain the transmittance similar to that of the conventional circular polarized film using the combination of the semi-transparent film 41 and the protective film 42.

[0057] The selective light absorbing layer 51 that includes pigments that selectively absorb light is formed on a surface of the sealing member 30 that faces the organic light emitting device 20.

[0058] FIG. 2 is a graph showing an optical transmittance (curve A) of a conventional circular polarized film with respect to wavelength and an optical transmittance (curve B) of the selective light absorbing layer 51 with respect to wavelength that includes blue and red pigments according to an embodiment of the present invention.

[0059] Referring to curve A, the organic light emitting display device on which a conventional circular polarized film is attached shows an optical transmittance of approximately 45% in the visible light range.

[0060] However, referring to curve B, the organic light emitting display device on which the selective light absorbing layer 51 is attached shows that, in a particular wavelength region, for example, in a wavelength near 550 nm (a green light wavelength region), the optical transmittance is a lower than the optical transmittance in a wavelength of approximately 450 nm (a blue light wavelength region) and the optical transmittance in a wavelength of approximately 650 nm (a red light wavelength region).

[0061] The selective light absorbing layer 51 is formed such that, after 2 wt% CoOA12O3 (cobalt blue) as a blue pigment and 0.2wt% Fe2O3 are dispersed in a binder resin, the resultant product is coated to a thickness of 4 to 5 μm on the sealing member 30, and afterwards, the coating is hardened using UV rays.

[0062] The selective light absorbing layer 51 made of a red pigment and a blue pigment selectively transmits light in a red light wavelength region and a blue light wavelength region, however, selectively absorbs the light in a green light wavelength region. That is, the optical transmittance in the green light wavelength region, which has high brightness, and thus, affects the most on contrast, is reduced, thereby effectively reducing reflection of external light by the flat panel display device.

[0063] The present invention is not limited thereto, that is, the selective light absorbing layer 51 can be formed by combination of various pigments having an optical transmittance of 10 to 90% in the green light wavelength region, that is, in a wavelength of near 550 nm.

[0064] A desired optical transmittance of the selective light absorbing layer 51 can be obtained by controlling the thickness of the selective light absorbing layer 51. That is, in order to increase the optical transmittance, the thickness of the selective light absorbing layer 51 is increased, and to reduce the optical transmittance, the thickness is reduced. Also, the thickness of the selective light absorbing layer 51 can be controlled in consideration of the optical transmittances of the semi-transparent film 41 and the protective film 42.

[0065] In particular, when the optical transmittances of the semi-transparent film 41 and the protective film 42 are taken into consideration, an overall optical transmittance of the organic light emitting display device can be controlled to be 40 to 60% although the selective light absorbing layer 51, the semi-transparent film 41, and the protective film 42 are used at the same time since the selective light absorbing layer 51 has an optical transmittance of 10 to 90% in a wavelength region of 550 nm. Therefore, although the selective light absorbing layer 51, the semi-transparent film 41, and the protective film 42 are used at the same time, the effect of preventing external light and increasing contrast can be obtained by realizing an optical transmittance of approximately 40%, which is approximately the same as, or higher than, the optical transmittance of a conventional circular polarized plate.

[0066] The black matrix layers 61 are formed on a surface of the selective light absorbing layer 51 opposite to the surface that faces the sealing member 30.

[0067] The black matrix layers 61 are patterned to be disposed in non-emission areas of the organic light emitting device 20. An emission area of the organic light emitting device 20 is an area where the organic light emitting layer 22 is formed, and the non-emission areas are the remaining parts of the emission area. In the present embodiment, the organic light emitting layer 22 is formed in the opening 24 of the pixel define layer 25 that surrounds a rim of the first electrode 21 so that the first electrode 21 is opened and has a step difference. At this point, the black matrix layers 61 are disposed on locations of the selective light absorbing layer 51 corresponding to the pixel define layer 25.

[0068] The black matrix layer 61 is formed to a thickness of 5 to 20 μm. The thick black matrix layer 61 formed on the selective light absorbing layer 51 corresponding to the non-emission areas of the organic light emitting device 20 effectively prevents external light reflection by the emission area of the organic light emitting device 20. That is, when external light reflected by metal electrodes formed in the emission area progresses in a direction in which light is extracted (towards the sealing member 30), the external light is absorbed by the black matrix layer 61 protruded from the sealing member 30.

[0069] When the black matrix layer 61 is formed to be thick, the absorption of external light can be increased. Also, a pixel unit can be protected from external impact by forming a predetermined gap between the sealing member 30 and the pixel unit of the organic light emitting device 20. That is, the black matrix layer 61 acts as a spacer formed in a conventional pixel define layer to protect the pixel unit from being damaged by external impact. Accordingly, a mask process performed to form the spacers on the pixel define layer can be omitted, thereby simplifying the manufacturing process.

[0070] Table 1 summarizes contrasts of organic light emitting display devices in which the conditions of the black matrix layer, the selective light absorbing layer, and the reflection preventive film are changed. The contrasts were evaluated by measuring reflection brightness when the external light was turned on and off using a NISTIR 6738 method under an external light of 1501ux atmosphere after white brightness was set at 100 cd/m2.

[Table 1]

Specimen No.	Conditions	Contrast
1	Bare cell+BM(1μm)	18,613
2	Bare cell+BM(10μm)	22,336
3	Bare cell+BM(1μm)+reflection preventive film+ selective light absorbing layer	62,347
4	Bare cell+BM(10μm)+reflection preventive film+ selective light absorbing layer	77,058
5	Bare cell+circular polarized film	76,538

[0071] The contrast of specimen 1 was measured under the conditions described above after the black matrix layer 61 having a thickness of 1 μm was spin coated on the sealing member 30, and by patterning. The contrast of specimen 2 was measured under the conditions described above after the black matrix layer 61 having a thickness of 10 μm was spin coated and patterned on the sealing member 30. When the contrasts of specimen 1 and specimen 2 are compared specimen 2 shows increased contrast by approximately 20%.

[0072] Also, the contrast of specimen 3 was measured under the conditions described above after the black matrix layer 61 having a thickness of 1 μm was spin coated on the sealing member 30 on which the reflection preventive film 40 and the selective light absorbing layer 51 were formed, and by patterning. The contrast of specimen 4 was measured under the conditions described above after the black matrix layer 61 having a thickness of 10 μm was spin coated and patterned on the sealing member 30 on which the reflection preventive film 40 and the selective light absorbing layer 51 are formed. When the contrasts of specimen 3 and specimen 4 are compared, specimen 4 shows increased contrast by approximately 20% like in the case of specimen 1 and specimen 2. That is, according to the above result, when the thickness of the black matrix layer 61 formed on a surface of the sealing member 30 through which light is extracted is increased to approximately 10 μm, contrast increases by approximately 20 %.

[0073] Specimen 5 shows measured contrast of an organic light emitting device to which a conventional circular polarized film is attached. Specimen 4 shows a contrast which is little higher than that of the specimen 5 in which a conventional circular polarized film is attached to the organic light emitting device. Accordingly, an organic light emitting display device having a contrast equal to, or higher than, the contrast of an organic light emitting display device having a conventional circular polarized film can be realized by appropriately controlling the thickness of the black matrix layer 61, the thickness of, or selection of pigments included in, the selective light absorbing layer 51, or the refractive index and thickness of the reflection preventive film 40.

[0074] At this point, the thickness of the black matrix layer 61 may not exceed 20 μm for the realization of a thin organic light emitting display device. Also, as described above, the thickness of the black matrix layer 61 may have a thickness of at least 5 μm in order to perform the function of spacers. Also, the black matrix layer 61 can be formed of an organic material comprising carbon black particles, a binder resin, and an optical initiator, or can be a graphite film formed by using an inorganic vacuum deposition method. However, the black matrix layer 61 according to the present invention is not limited thereto, that is, any material that can absorb external light can be used for forming the black matrix layer 61.

[0075] As described above, an organic light emitting display device according to the present embodiment can increase contrast since a selective light absorbing layer 51 that includes pigments that selectively absorb light and black matrix layer 61 are included on a sealing member 30. Also, a protective film 42 having a high impact resistance is formed on a surface of the sealing member 30, and thus, an outer surface of the organic light emitting display device can be protected from external impact. Also, thick black matrix layer 61 are employed on a surface of the selective light absorbing layer 51, and thus, pixel units of the organic light emitting display device can be protected from external impact.

[0076] Organic light emitting display devices according to another embodiment of the present invention will now be described with reference to FIGS. 3 and 4. Hereinafter, features different from the embodiment described with reference to FIG. 1 will be mainly described, and like numerals refer to like elements.

[0077] Referring to FIG. 3, the organic light emitting display device according to another embodiment of the present invention includes a substrate 10, an organic light emitting device 20, a sealing member 30, a reflection preventive film 40, a selective light absorbing layer 52, and black matrix layer 62.

[0078] The organic light emitting device 20 formed on the substrate 10 includes a first electrode 21, a pixel define layer 25 in which an opening 24 is formed to expose the first electrode 21, an organic light emitting layer 22 formed on the first electrode 21 on which the opening 24 is formed, and a second electrode 23 formed on the organic light emitting layer 22.

[0079] The sealing member 30 is formed above the organic light emitting device 20 and the reflection preventive layer 40 is formed on the surface of the sealing member 30 that faces the exterior of the organic light emitting device 20. The reflection preventive layer 40 includes a semi-transparent film 41 that transmits some external light and reflects the rest of the external light and a protective film 42 having a refractive index less than that of the semi-transparent film 41 and covering the semi-transparent film 41.

[0080] The black matrix layer 62 is formed on an area of surfaces of the sealing member 30 that faces the organic light emitting device 20 corresponding to the pixel define layer 25 of the organic light emitting device 20. The selective light absorbing layer 52 that includes pigments that selectively absorb light is formed on a surface of the black matrix layer 62 that faces the organic light emitting device 20 to cover the black matrix layers 62.

[0081] Referring to FIG. 4, the organic light emitting display device according to another embodiment of the present invention includes a substrate 10, an organic light emitting device 20, a sealing member 30, a reflection preventive layer 40, a selective light absorbing layer 53, and black matrix layers 63.

[0082] The organic light emitting device 20 formed on the substrate 10 includes a first electrode 21, a pixel define layer 25 in which an opening 24 is formed to expose the first electrode 21, an organic light emitting layer 22 formed on the first electrode 21 on which the opening 24 is formed, and a second electrode 23 formed on the organic light emitting layer 22.

[0083] The sealing member 30 is formed above the organic light emitting device 20 and the reflection preventive layer 40 is formed on the surface of the sealing member 30 that faces the exterior of the organic light emitting device 20. The reflection preventive layer 40 includes a semi-transparent film 41 that transmits some external light and reflects the rest of the external light and a protective film 42 having a refractive index less than that of the semi-transparent film 41 and covering the semi-transparent film 41.

[0084] The black matrix layer 63 is formed on an area of the surface of the sealing member 30 that faces the organic light emitting device 20 corresponding to the pixel define layer 25 of the organic light emitting device 20. The selective light absorbing layer 53 that includes pigments that selectively absorb light is formed on areas of the surface of the sealing member 30 that faces the organic light emitting device 20 between the black matrix layers 63. In the above structure, the pigments included in the selective light absorbing layer 53 can be arranged in various combinations corresponding to each of pixels that emit red, green, and blue light, thereby further increasing the quality of the organic light emitting display device.

[0085] As described above, an organic light emitting display device according to the present embodiments can increase contrast since a selective light absorbing layer 52 and 53 that include pigments that selectively absorb light and black matrix layer 62 and 63 are included on a sealing member 30. Also, a protective film 42 having a high impact resistance is formed on a surface of the sealing member 30, and thus, an outer surface of the organic light emitting display device can be protected from external impact. Also, thick black matrix layers 62 and 63 are employed on a surface of the selective light absorbing layer 52 and 53, and thus, pixel units of the organic light emitting display device can be protected from external impact.

[0086] An organic light emitting display device according to the present invention can increase contrast.

[0087] While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the scope of the present invention as defined by the following claims.

Claims

1. An organic light emitting display device comprising:

a substrate (10);
an organic light emitting device (20) disposed on the substrate (10) to display images;
a sealing member (30) formed above the organic light emitting device (20); and
a selective light absorbing layer (51, 52, 53) and a black matrix layer (61, 62, 63) disposed between the substrate (10) and the sealing member (30);

wherein the selective light absorbing layer (51, 52, 53) comprises pigments that selectively absorb light; and wherein the black matrix layer (61, 62, 63) corresponds to non-emission areas of the organic light emitting device (20).

2. The organic light emitting display device of claim 1, wherein the selective light absorbing layer (51) is formed on a surface of the sealing member (30) facing the organic light emitting device (20) and the black matrix layer (61) is formed on the selective light absorbing layer (57).

3. The organic light emitting display device of claim 1, wherein the black matrix layer (62) is formed on a surface of the sealing member (30) facing the organic light emitting device (20); and

the selective light absorbing layer (52) covers the black matrix layer (62) and is formed on parts of the surface of the sealing member (30) that faces the organic light emitting device (20) which are not covered by the black matrix layer (62).

4. The organic light emitting display device of claim 1, wherein the black matrix layer (63) is formed on a surface of the sealing member (30) that faces the organic light emitting device (30) and the selective light absorbing layer (53) is formed on the surface of the sealing member (30) facing the organic light emitting device (20) in areas which are not covered by the black matrix layer (63).

5. The organic light emitting display device of any one of the preceding claims, wherein the organic light emitting device (20) comprises a first electrode (21), a pixel define layer (25) in which an opening (24) is formed to expose the first electrode (21), an organic light emitting layer (22) formed on the first electrode (21) which is exposed by the opening (24), and a second electrode (23) formed on the organic light emitting layer (22), wherein the black matrix layer (61, 62, 63) is formed to correspond to the pixel define layer (25) of the organic light emitting device (20).

6. The organic light emitting display device of any one of the preceding claims, wherein the selective light absorbing layer (51, 52, 53) comprises a red pigment and a blue pigment.

7. The organic light emitting display device of any one of the preceding claims, wherein the selective light absorbing layer (51, 52, 53) has an optical transmittance of 10 to 90% at a wavelength of 550 nm.

8. The organic light emitting display device of any one of the preceding claims, wherein the black matrix layer (61, 62, 63) has a thickness of 5 to 20 μm.

9. The organic light emitting display device of any one of the preceding claims, wherein the black matrix layer (61, 62, 63) comprises a material selected from the group consisting of carbon black particles and graphite.

10. The organic light emitting display device of any one of the preceding claims, further comprising a reflection preventive layer (40) formed on one of the surfaces of the sealing member (30).

11. The organic light emitting display device of claim 10, wherein the reflection preventive layer (40) comprises a semi-transparent film (41) that transmits some external light and reflects the rest of the external light and a protective film (42) covering the semi-transparent film (41), and the semi-transparent film (41) has a refractive index greater than that of the protective film (42).

12. The organic light emitting display device of claim 11, wherein the protective film (42) is formed of a thermosetting resin.

13. The organic light emitting display device of claim 11 or 12, wherein the protective film (42) comprises a material selected from the group consisting of urethane acrylate and epoxy resin.

14. The organic light emitting display device of any one of claims 11 to 13, wherein the semi-transparent film (41) has an optical transmittance of 40 to 80%.

15. The organic light emitting display device of any one of claims 11 to 14, wherein the semi-transparent film (41) has a refractive index of 1.5 to 5.

16. The organic light emitting display device of any one of claims 11 to 15, wherein the semi-transparent film (41) is formed of a metal colloid.

17. The organic light emitting display device of any one of claims 11 to 16, wherein the semi-transparent film (41) comprises Au, Ag, or Ti.

FIG. 1

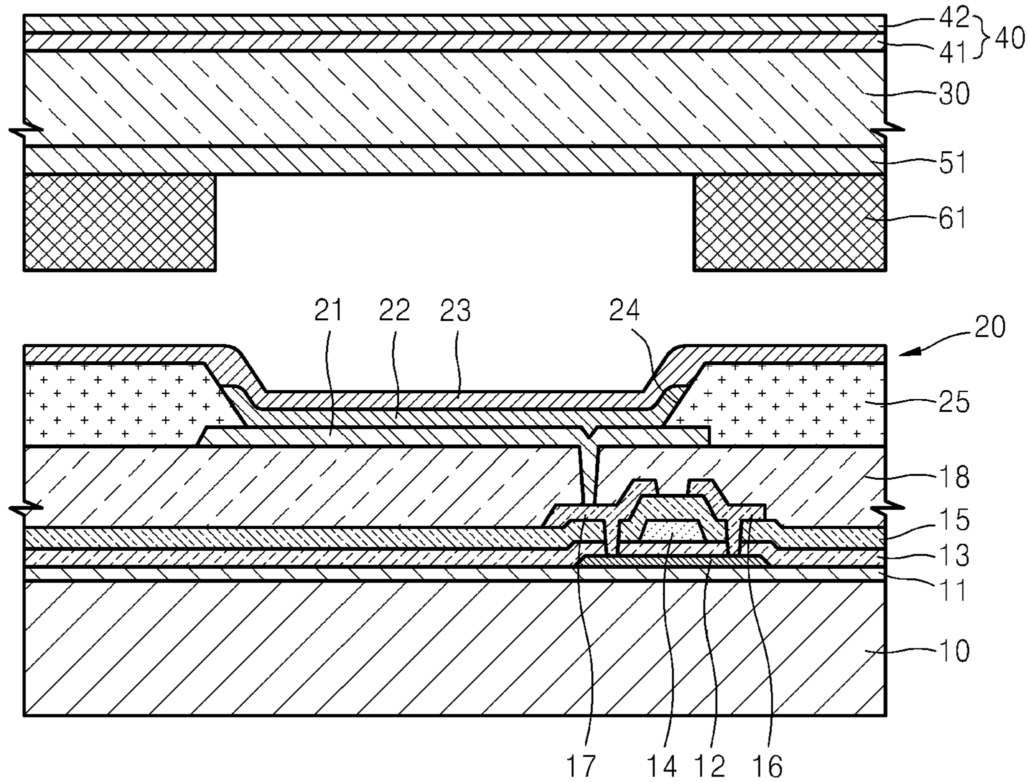


FIG. 2

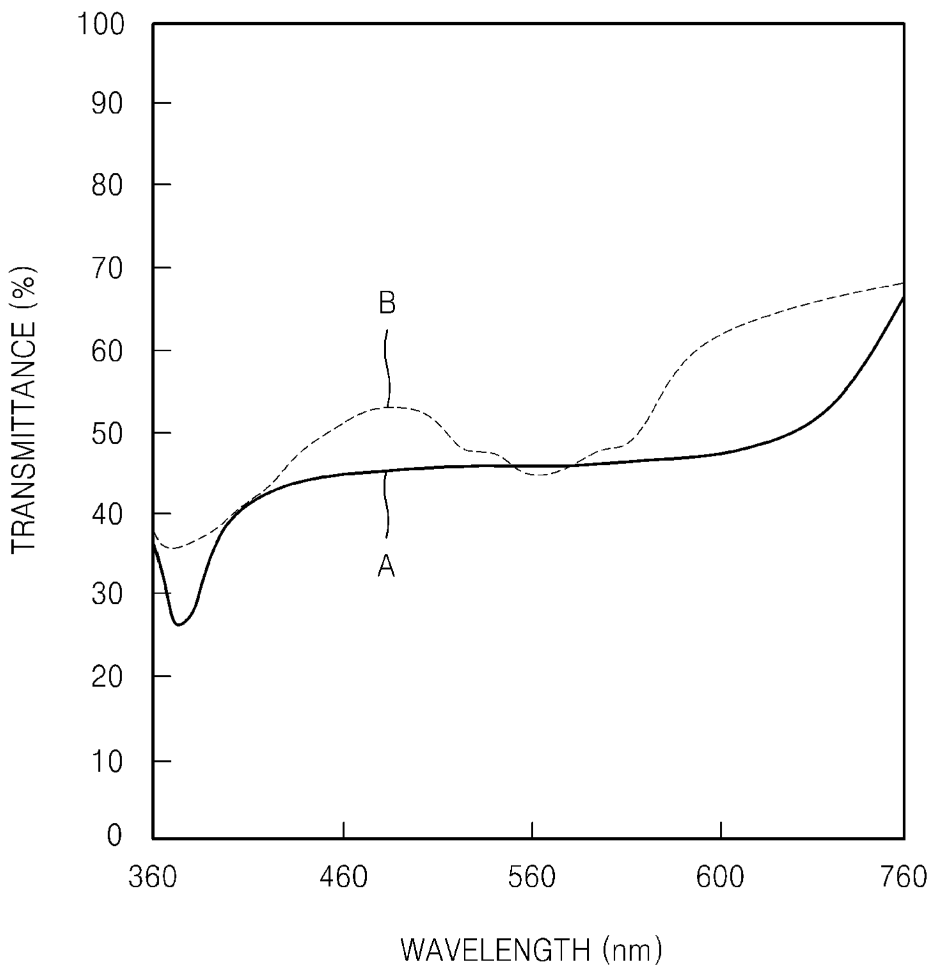

100
90
80
70
60
50
40
30
20
10
0
TRANSMITTANCE (%)
B
A
360
460
560
600
760
WAVELENGTH (nm)

FIG. 3

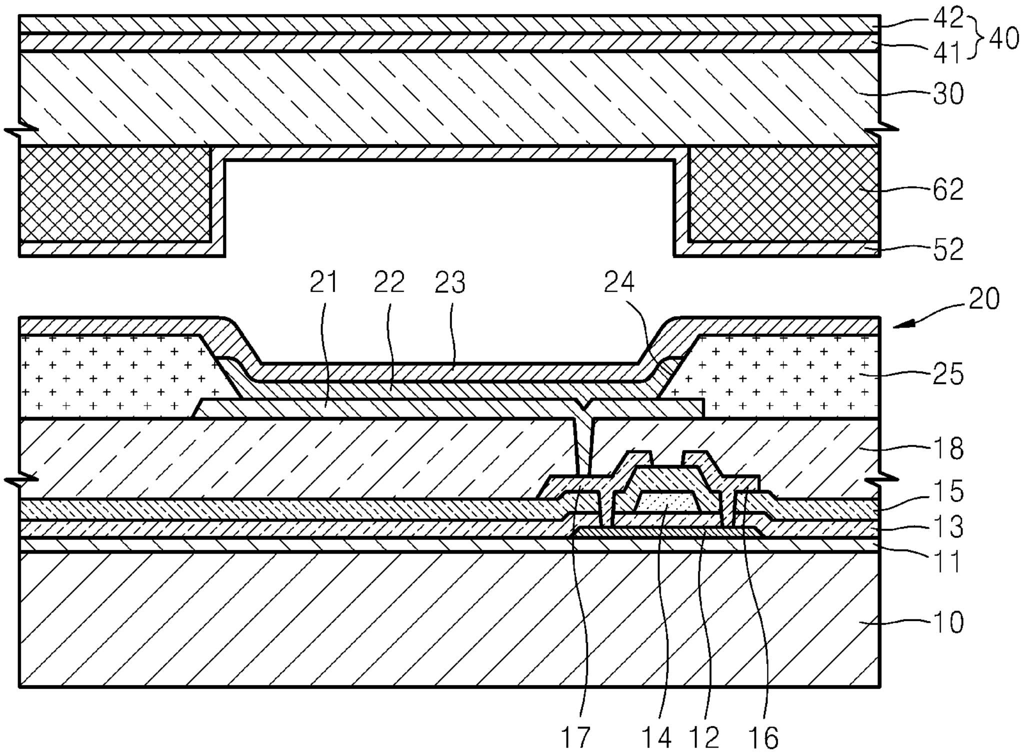
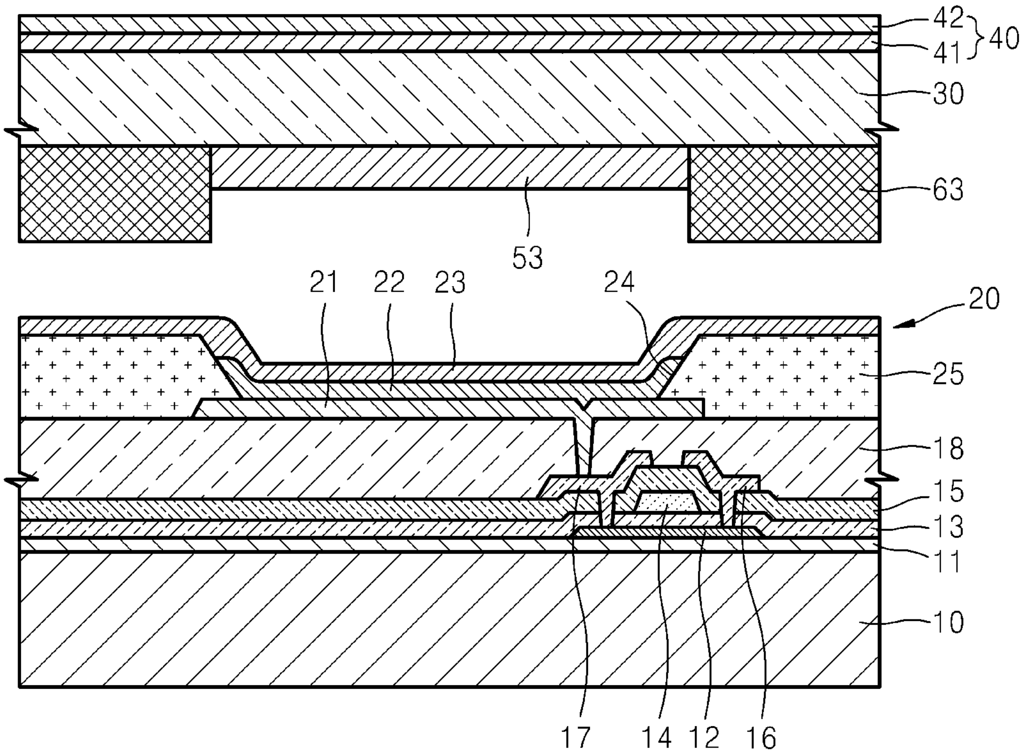


FIG. 4



patsnap

专利名称(译)	有机发光显示装置		
公开(公告)号	EP1965429A2	公开(公告)日	2008-09-03
申请号	EP2008102117	申请日	2008-02-28
[标]申请(专利权)人(译)	三星斯笛爱股份有限公司		
申请(专利权)人(译)	三星SDI CO.，LTD.		
当前申请(专利权)人(译)	三星DISPLAY CO.，LTD.		
[标]发明人	CHO YOON HYEUNG C O LEGAL & IP TEAM LEE BYOUNG DUK C O LEGAL & IP TEAM OH MIN HO C O LEGAL & IP TEAM LEE SO YOUNG C O LEGAL & IP TEAM LEE SUN YOUNG C O LEGAL & IP TEAM KIM WON JONG C O LEGAL & IP TEAM CHOI JIN BAEK C O LEGAL & IP TEAM LEE JONG HYUK C O LEGAL & IP TEAM KIM YONG TAK C O LEGAL & IP TEAM		
发明人	CHO, YOON-HYEUNG C/O LEGAL & IP TEAM LEE, BYOUNG-DUK C/O LEGAL & IP TEAM OH, MIN-HO C/O LEGAL & IP TEAM LEE, SO-YOUNG C/O LEGAL & IP TEAM LEE, SUN-YOUNG C/O LEGAL & IP TEAM KIM, WON-JONG C/O LEGAL & IP TEAM CHOI, JIN-BAEK C/O LEGAL & IP TEAM LEE, JONG-HYUK C/O LEGAL & IP TEAM KIM, YONG-TAK C/O LEGAL & IP TEAM		
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摘要(译)

提供一种具有增强的对比度和抗冲击性的有机发光显示装置。有机发光装置包括基板（10）;有机发光器件（20），设置在基板上以显示图像;密封构件（30）形成在有机发光装置上方;选择性光吸收层（51），其形成在密封构件的面向有机发光器件的表面上，并包括选择性地吸收光的颜料;形成在选择性光吸收层上的黑色矩阵层（61）对应于有机发光器件的非发射区域。

FIG. 1