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

Organische lichtemittierende Diodenanzeige

Affichage à diode électroluminescente organique

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Description**BACKGROUND OF THE INVENTION****Field of the Invention**

[0001] The present invention relates to an organic light emitting diode (OLED) display. More particularly, the present invention relates to an OLED display having improved visibility outdoors by minimizing reflection of external light.

Description of the Related Art

[0002] In an organic light emitting diode (OLED) display, display quality is greatly influenced by external light. That is, when external light is transmitted to the OLED display, reflection of the external light occurs in layers that form an organic emission element and a thin film transistor. For example, a metal layer used as an electrode has high light reflectivity so that the metal layer reflects most of the external light. The reflected external light is mixed with the light emitted from an organic emission layer such that visibility of the screen is undesirably deteriorated.

[0003] In order to solve the above-stated problem, a linear polarization film and a $\lambda/4$ phase delay film are disposed in a side where the external light is transmitted in a contemporary OLED display. In this structure, a polarizing axis is changed by 90 degrees when the external light passes through the linear polarization film and the $\lambda/4$ phase delay film and is then reflected by internal layers, and therefore the external light is absorbed since the external light cannot pass through the linear polarization film. Through this theory, the reflection of the external light can be suppressed to thereby enhance visibility.

[0004] In the above-described structure, however, half of the light (non-polarized light) emitted from the organic emission layer is blocked since the light cannot pass through the linear polarization film. Such a light loss undesirably decreases efficiency (luminance/power consumption) of the OLED display.

[0005] In addition, WO 03/001555 A1 discloses a photochromic optical element comprising a substrate with a transparent coating. The coating comprises a photochromic material. The transmission of the optical element can vary in the visible wavelength range in response to a variation of light incident on the coating. EP 1 164 641 A2 discloses a light emitting element with a photosensor to sense the illuminance of the environment and to adjust the luminance of the light emitting element to the sensed illuminance.

[0006] The above information disclosed in this Background section is only for enhancement of understanding of the background of the invention and therefore it may contain information that does not form the prior art that is already known to a person of ordinary skill in the art.

SUMMARY OF THE INVENTION

[0007] It is therefore an object of the present invention to provide an improved an organic light emitting diode (OLED) display.

[0008] It is another object to provide an organic light emitting diode (OLED) display having an advantage of enhancing visibility by minimizing reflection of external light while maintaining high efficiency.

These and other objects may be attained in the practice of the principles of the present invention, with an OLED display constructed with a substrate where OLEDs are formed and an encapsulation member that is fixed onto the substrate while covering the OLEDs. The encapsulation member includes a photochromic material so that the encapsulation member is colored by external light. Further, a photosensor is disposed in an overlapping area of the substrate and the encapsulation member, wherein the photosensor is adapted to detect a change of external light passing through the encapsulation member in response to a coloration degree of the encapsulation member.

That is, the amount of photochromic material which is included in the encapsulation member is such that the optical transmittance of the encapsulation member for visible light (380 - 760 nm) decreases under exposure of external light. More preferably, the encapsulation member includes a photochromic material so that the encapsulation member is colored by external UV (ultraviolet) light but is not significantly colored by external visible light. In the sense of the present invention, UV light has a wavelength shorter than 380 nm, preferably between 100 nm - 380 nm, more preferably between 200 nm - 380 nm, still more preferably between 280 nm - 380 nm and still more preferably between 315 nm - 380 nm. That is, according to a preferred embodiment of the present invention, the encapsulation member including the photochromic material (partially but significantly) absorbs external visible light which contains UV radiation such as sunlight thereby decreasing unwanted reflections of the visible external light. However, when no external UV radiation is present, the transmittance of the light emitted by the OLED display is high. Preferably, the encapsulation member includes a photochromic material such that the transmittance of the visible light is reduced by the photochromic material by at least 10% (more preferably 20%, still more preferably 30%, still more preferably 40%, still more preferably 50% and still more preferably 60%) under exposure of external UV light (compared to the transmittance of the visible light when the photochromic material is not present) while the transmittance of the visible light is not reduced or only reduced by the photochromic material by less than least 9% (more preferably less than 7%, still more preferably less than 6%, still more preferably less than 5%, still more preferably less than 4% and still more preferably less than 3%) when no external UV light is incident on the encapsulation member.

[0010] The substrate may be a semiconductor substrate, and the encapsulation member may be an encapsulation substrate. The encapsulation substrate may be formed of glass.

[0011] The encapsulation member may be a thin film encapsulation layer comprising a plurality of inorganic layers and a plurality of organic layers that are alternately stacked. Preferably at least one of the plurality of inorganic layers and the plurality of organic layers comprises the photochromic material. The farthest layer among the plurality of inorganic layers and the plurality of organic layers from the substrate may include the photochromic material. Preferably the inorganic layer is formed of one selected from a group of aluminum oxide or silicon oxide, and the organic layer is formed of one selected from a group of epoxy, acrylate, and urethane acrylate. The OLED display may further include a photosensor disposed between the thin film encapsulation layer and the substrate. The OLED display may further comprise a photosensor disposed in an area where the substrate and the encapsulation member are overlapped.

[0012] The photochromic material may include one selected from a group of silver halide, zinc halide, cadmium halide, copper halide, and magnesium halide. The photochromic material may consist of one selected from a group of silver halide, zinc halide, cadmium halide, copper halide, and magnesium halide.

[0013] The photochromic material may include one selected from a group of spiropyran, spironaphthoxazine dye, diarylethene derivatives, dehydropyridine, furylfulgide derivatives, and azobenzene derivatives. The photochromic material may consist of one selected from a group of spiropyran, spironaphthoxazine dye, diarylethene derivatives, dehydropyridine, furylfulgide derivatives, and azobenzene derivatives.

[0014] Preferably the OLED display further comprises an analog to digital (A/D) converter receiving an analog signal output from the photosensor, and converting the analog signal into a digital signal; and a data driver receiving the digital signal output from the analog to digital converter, and providing a data voltage that corresponds to a coloration degree of the encapsulation member (or light intensity measured by the photosensor). Preferably the ratio of the data voltage and the light intensity measured by the photosensor is kept constant under all conditions of external light. Preferably the data driver further comprises a gamma controller including a plurality of gamma curves that respectively correspond to the coloration degree of the encapsulation member.

[0015] A photochromic material in the understanding of the present invention is a material that shows photochromism. Photochromism in the understanding of the present invention is the behavior of compounds (i.e. material) that undergo a reversible photochemical reaction where an absorption band in the visible part of the electromagnetic spectrum changes significantly in strength or wavelength. The degree of change required for a photochemical reaction to be "photochromic" in the sense of

the present invention is that which appears significant by eye.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] A more complete appreciation of the invention, and many of the attendant advantages thereof, will be readily apparent as the same becomes better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings in which like reference symbols indicate the same or similar components, wherein:

[0017] FIG. 1 is an oblique view of an organic light emitting diode (OLED) display constructed as a first exemplary embodiment to describe the non-photosensor structure of the inventive second embodiment of Fig. 6;

[0018] FIG. 2 is a cross-sectional view of the OLED display constructed as the first exemplary embodiment;

[0019] FIG. 3 shows a sub-pixel circuit of a panel assembly of FIG. 1;

[0020] FIG. 4 and FIG. 5 are partial cross-sectional views of the panel assembly of FIG. 1;

[0021] FIG. 6 is an oblique view of an OLED display constructed as a second exemplary embodiment according to the principles of the present invention;

[0022] FIG. 7 is a block diagram of the OLED display according to the second exemplary embodiment of the present invention;

[0023] FIG. 8 is a partial enlarged cross-sectional view of an OLED display constructed as a third exemplary embodiment to describe the non-photosensor structure of the inventive fourth embodiment of Fig. 9; and

[0024] FIG. 9 is a cross-sectional view of an OLED display constructed as a fourth exemplary embodiment according to the principles of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0025] The present invention will be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown.

[0026] FIG. 1 and FIG. 2 respectively show an oblique view and a cross-sectional view of an organic light emitting diode (OLED) display constructed as a first exemplary embodiment. The first embodiment is only background art to describe the non-photosensor structure of the inventive second embodiment of Fig. 6.

[0027] Referring to FIG. 1 and FIG. 2, an OLED display 101 according to the first exemplary embodiment includes a panel assembly 12 having a display area A10 and a pad area A20 and displaying a predetermined video and visual image in display area A10, a flexible circuit board 14 fixed to pad area A20, and a printed circuit board 16 electrically connected to panel assembly 12 through flexible circuit board 14.

[0028] Panel assembly 12 includes a first substrate (or, a semiconductor substrate) 18 and a second substrate

(or, an encapsulation substrate) 22 that is smaller than first substrate 18 and having an edge fixed to first substrate 18 by a sealant 20 (refer to FIG. 2). Display area A10 is located in an area where first substrate 18 and second substrate 20 are overlapped at an interior side of sealant 20, and pad area A20 is located on first substrate 18 at an external side of sealant 20.

[0029] A plurality of subpixels are disposed in a matrix pattern in display region A10 of first substrate 18, and a scan driver (not shown) and a data driver (not shown) are located between display area A10 and sealant 20 or at the external side of sealant 20 for driving the subpixels. In pad area A20 of first substrate 18, pad electrodes (not shown) for transmitting electrical signals to the scan and data drivers are located.

[0030] An integrated circuit chip 24 is mounted on pad area A20 of first substrate 18, and flexible circuit board 14 is electrically connected to the pad electrodes and integrated circuit chip 24. A protective layer 26 is formed around integrated circuit chip 24 and flexible circuit board 14 to cover the pad electrodes formed in pad area A20 for protection. In the printed circuit board 16, electronic components are provided for processing driving signals, and a connector 28 is provided for transmitting external signals to the printed circuit board 16.

[0031] In a rear side of panel assembly 12, a bezel (not shown) for increasing bending strength of panel assembly 12 or a buffering tape (not shown) for increasing impact resistance of panel assembly 12 may be formed. Flexible circuit board 14 fixed to pad area A20 is bent to the rear side of panel assembly 12 to make the printed circuit board 16 face the rear side of panel assembly 12.

[0032] FIG. 3 shows a structure of a sub-pixel of the panel assembly of FIG. 1, and FIG. 4 is a partial enlarged cross-sectional view of the panel assembly of FIG. 1.

[0033] Referring to FIG. 3 and FIG. 4, a sub-pixel of panel assembly 12 is formed of an OLED L1 and a driving circuit unit. OLED L1 includes an anode (hole injection electrode) 30, an organic emission layer 32, and a cathode (electron injection electrode) 34, and the driving circuit unit includes at least two thin film transistors T1 and T2 and at least one storage capacitor C1. The two thin film transistors T1 and T2 are a switching transistor T1 and a driving transistor T2, respectively.

[0034] Switching transistor T1 is connected to a scan line SL1 and a data line DL1, and transmits a data voltage input to data line DL1 according to a switching voltage that is input to scan line SL1 to driving transistor T2. Storage capacitor C1 is connected to switching transistor T1 and power source line VDD, and stores a voltage that corresponds to a voltage difference between a voltage transmitted from switching transistor T1 and a voltage supplied to power source line VDD.

[0035] Driving transistor T2 is connected to power source line VDD and storage capacitor C1, and supplies an output current I_{OLED} that is proportional to the square of the difference between the voltage stored in storage capacitor C1 and a threshold voltage to OLED L1. OLED

L1 emits light by output current I_{OLED} . Driving transistor T2 includes a source electrode 36, a drain electrode 38, and a gate electrode 40, and anode 30 of OLED L1 may be connected to drain electrode 38 of driving transistor T2. The configuration of the sub-pixel is not limited thereto, and may be variously modified.

[0036] In OLED L1, anode 30 is formed of a metal layer having a light reflection characteristic, and cathode 34 is formed of a transparent conductive layer. Therefore, light emitted from organic emission layer 32 passes through cathode 34 and second substrate 22 and is emitted out. Anode 30 reflects the light emitted toward first substrate 18 along with the light emitted from organic emission layer 32 to second substrate 22 to thereby enhance luminous efficiency. Second substrate 22 is an encapsulation member that covers OLEDs L1 for protection, and is made of glass.

[0037] In the first exemplary embodiment, a substrate on which external light is incident, that is, second substrate 22, includes a photochromic material which is an ultraviolet (UV) discoloration material. The second substrate 22 including the photochromic material has a characteristic that it displays a color when UV light illuminates the second substrate 22 and returns to a transparent state when the UV light does not illuminate the second substrate 22. The photochromic material is mixed with glass during a manufacturing process of second substrate 22 and uniformly dispersed inside second substrate 22. In FIG. 4, photochromic material 42 is schematically illustrated as round particles.

[0038] Any well-known photochromic material can be used as photochromic material 42. For example, photochromic material 42 may be selected from a group consisting of silver halide, zinc halide, cadmium halide, copper halide, and magnesium halide. Alternatively, photochromic material 42 may be selected from a group consisting of spiropyrane, spironaphthoxazine dye, diarylethene derivatives, dehydropyridine, furylfulgide derivatives, and azobenzene derivatives. Photochromic material 42 included in second substrate 22 is not, however, limited thereto.

[0039] As described, second substrate 22 including photochromic material 42 has high light transmittance because second substrate 22 becomes colorless upon exposure to weak sunlight, for example in a normal indoor environment. In addition, under a strong sunlight condition, second substrate 22 becomes colored by photochromic material 42 and absorbs external light. That is, in the case that an electron device using OLED display 101 is observed outdoors during the daytime, second substrate 22 becomes colored (refer to FIG. 5).

[0040] Therefore, OLED display 101 according to the first exemplary embodiment of the principles of the present invention can increase visibility of the screen by reducing reflection of external light under a strong sunlight condition. In this case, transmittance of light emitted from organic emission layer 32 is reduced due to coloration of second substrate 22, but the amount of the re-

duced transmittance of light is less than that in a case in which a linear polarization film and a $\lambda/4$ phase delay film are applied, instead of the photochromic material, on OLEDs L1. Accordingly, efficiency (luminance/power consumption) of OLED display 101 can be improved.

[0041] FIG. 6 is an oblique view of an OLED display constructed a second exemplary embodiment according to the principles of the present invention.

[0042] Referring to FIG. 6, an OLED display 102 according to the second exemplary embodiment is the same as the OLED display of the first exemplary embodiment, except that a photosensor 44 is formed inside a panel assembly 12. Like reference numerals are used for like elements of the first exemplary embodiment.

[0043] Photosensor 44 is disposed on a portion of first substrate 18 which overlaps second substrate 22. Photosensor 44 may be disposed between sub-pixels in display area A10, or may be disposed between display area A10 and a sealant 20 (refer to FIG. 2). FIG. 6 illustrates a case in which photosensor 44 is exemplarily disposed at an external side of display area A10. Photosensor 44 detects the amount of light passing through second substrate 22 in order to increase the light emission intensity of organic emission layer 32 (refer to FIG. 4) when second substrate 22 is colored.

[0044] FIG. 7 is a block diagram of the OLED display according to the second exemplary embodiment of the principles of the present invention. Referring to FIG. 7, OLED display 102 includes photosensor 44, an analog to digital (A/D) converter 46, a data driver 48, and a panel assembly 12 where display area A10 is formed.

[0045] Photosensor 44 is formed of various types of sensors that can detect the amount of surrounding light. For example, photosensor 44 may be formed of one of a photodiode, a charge-coupled element, a charge injection element, a photomultiplier tube, a spectroradiometer, and a complementary metal-oxide semi-conductor (CMOS) photoelectric element. Photosensor 44 outputs a voltage signal or a current signal corresponding to the amount of light passing through second substrate 22. In this case, a coloration degree of second substrate 22 is increased as the strength of the external light is increased, and photosensor 44 can detect a small amount of external light.

[0046] A/D converter 46 receives a voltage or a current output from photosensor 44 as an analog signal and converts the analog signal into a digital signal. By using the digital signal provided from A/D converter 46, data driver 48 provides a data voltage that appropriately corresponds to the coloration degree of second substrate 22 to panel assembly 12. The data voltage output from data driver 48 is formed of individual data voltages representing red, green, and blue. For this, data driver 48 includes a gamma controller 50.

[0047] Gamma controller 50 includes a plurality of gamma curves that respectively correspond to the coloration degree of second substrate 22, detected by photosensor 44. Data driver 48 can control the data voltage

provide to panel assembly 12 by using a data voltage setting value stored in gamma controller 50.

[0048] By the above-described configuration, OLED display 102 according to the second exemplary embodiment can enhance visibility and contrast ratio of the display by increasing light emission intensity of organic emission layer 30 (refer to FIG. 4) as the coloration degree of second substrate 22 is increased.

[0049] FIG. 8 is a partial enlarged cross-sectional view of an OLED display constructed as a third exemplary embodiment. The third embodiment is only background art to describe the non-photosensor structure of the inventive fourth embodiment of Fig. 9.

[0050] Referring to FIG. 8, an OLED display 103 according to the third exemplary embodiment is the same as the OLED display of the first exemplary embodiment except that a thin film encapsulation layer 52 is provided as an encapsulation member instead of the second substrate of the first exemplary embodiment. Like reference numerals are used for like elements of the first exemplary embodiment.

[0051] Thin film encapsulation layer 52 is formed or two or more inorganic layers 521 and two or more organic layers 522. Inorganic layers 521 and organic layers 522 are alternately stacked. FIG. 8 illustrates a case in which thin film encapsulation layer 52 is formed by alternately stacking each of two inorganic layers 521 and each of two organic layers 522.

[0052] Inorganic layer 521 may be formed of aluminum oxide or silicon oxide, and organic layer 522 may be formed of any one of epoxy, acrylate, and urethane acrylate. Inorganic layer 521 suppresses penetration of external moisture and oxygen, and organic layer 522 eases internal stress of inorganic layer 521 or fills micro-cracks and pinholes of inorganic layer 521.

[0053] Among the plurality of layers that form thin film encapsulation layer 52, at least one layer includes a photochromic material 42 so that thin film encapsulation layer 52 is colored by external light. When at least one inorganic layer 521 includes photochromic material 42, photochromic material 42 is mixed with an inorganic layer forming material during the inorganic layer forming process so that photochromic material 42 can be uniformly dispersed inside inorganic layer 521. When at least one organic layer 522 includes photochromic material 42, photochromic material 42 is mixed with an organic layer forming material during the organic layer forming process so that photochromic material 42 can be uniformly dispersed inside organic layer 522.

[0054] The uppermost layer (the farthest layer from first substrate 18) among the plurality of layers forming thin film encapsulation layer 52 may include photochromic material 42. In this case, reflection of external light by the layers forming encapsulation layer 52 can be minimized. FIG. 8 illustrates a case in which photochromic material 42 is included in the uppermost organic layer 522 of thin film encapsulation layer 522.

[0055] FIG. 9 is a cross-sectional view of an OLED

display constructed as a fourth exemplary embodiment according to the principles of the present invention.

[0056] Referring to FIG. 9, an OLED display 104 according to the fourth exemplary embodiment is the same as the OLED display of the third exemplary embodiment except that a photosensor 44 is provided in a lower portion of a thin film encapsulation layer 52. Like reference numerals are used for like elements of the first exemplary embodiment.

[0057] Photosensor 44 is disposed on a portion of a first substrate 18 which overlaps thin film encapsulation layer 52. Photosensor 44 may be disposed between subpixels in a display area A10, or may be disposed at an external side of display area A10. FIG. 9 illustrates a case in which photosensor 44 is exemplarily disposed at the external side of display area A10.

[0058] Photosensor 44 detects the amount of light passing through thin film encapsulation layer 52 in order to increase light emission intensity of an organic emission layer 32 (refer to FIG. 8) when thin film encapsulation layer 52 is colored. Photosensor 44 is connected to an A/D converter and a data driver, and configurations and functions of photosensor 44, the A/D converter, the data driver, and a gamma controller are the same as those of the OLED display of the second exemplary embodiment.

[0059] While this invention has been described in connection with what is presently considered to be practical exemplary embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the scope of the appended claims.

Claims

1. An organic light emitting diode display (101), comprising:

a substrate (18) where organic light emitting diodes (L1) are formed; and
 an encapsulation member (22, 52) that is fixed onto the substrate (18) while covering the organic light emitting diodes (L1), wherein the encapsulation member (22, 52) comprises a photochromic material (42) so that the encapsulation member (22, 52) is colored by external light,

characterized in that

a photosensor (44) is disposed in an overlapping area of the substrate (18) and the encapsulation member (22, 52), wherein the photosensor (44) is adapted to detect a change of external light passing through the encapsulation member (22, 52).

2. The organic light emitting diode display of claim 1, wherein the substrate (18) is a semiconductor sub-

strate, and the encapsulation member (22, 52) is an encapsulation substrate.

3. The organic light emitting diode display of claim 2, wherein the encapsulation substrate (22, 52) is formed of glass.

4. The organic light emitting diode display according to one of claims 1 to 2, wherein the encapsulation member (52) is a thin film encapsulation layer comprising a plurality of inorganic layers (521) and a plurality of organic layers (522) that are alternately stacked.

5. The organic light emitting diode display of claim 4, wherein at least one of the plurality of inorganic layers (521) and the plurality of organic layers (522) comprises the photochromic material (42).

6. The organic light emitting diode display according to one of claims 4 and 5, wherein the farthest layer among the plurality of inorganic layers (521) and the plurality of organic layers (522) from the substrate (18) includes the photochromic material (42).

7. The organic light emitting diode display according to any one of claims 4 to 6, wherein the inorganic layer (521) is formed of one selected from a group of aluminum oxide or silicon oxide, and/or the organic layer (522) is formed of one selected from a group of epoxy, acrylate, and urethane acrylate.

8. The organic light emitting diode display according to any one of the preceding claims, wherein the photochromic material (42) comprises one selected from a group of silver halide, zinc halide, cadmium halide, copper halide, and magnesium halide.

9. The organic light emitting diode display according to any one of claims 1 to 7, wherein the photochromic material (42) comprises one selected from a group of spiropyran, spironaphthoxazine dye, diarylethene derivatives, dehydropyridine, furylfulgide derivatives, and azobenzene derivatives.

10. The organic light emitting diode display according to any one of claims 1 to 9, further comprising:

an analog to digital converter (46) adapted for receiving an analog signal output from the photosensor (44), and adapted for converting the analog signal into a digital signal; and
 a data driver (48) adapted for receiving the digital signal output from the analog to digital converter (46), and adapted for providing a data voltage that corresponds to a coloration degree of the encapsulation member (22, 52), wherein the data driver (48) further comprises a gamma controller (50) including a plurality of gamma curves

that respectively correspond to the coloration degree of the encapsulation member (22, 52).

11. The organic light emitting diode display of claim 10, wherein the data voltage is provided to the panel assembly (12) by using a data voltage setting value stored in the gamma controller (50).
12. The organic light emitting diode display according to any one of the preceding claims 1 to 3 or 8 to 11, wherein the encapsulation member (22, 52) is formed of a glass substrate and the photochromic material (42) is buried within the glass substrate.
13. The organic light emitting diode display according to any one of the preceding claims, wherein the photochromic material (42) is uniformly dispersed inside the encapsulation member (22, 52).
14. The organic light emitting diode display according to any one of the preceding claims, wherein the photochromic material (42) consists of round particles.

Patentansprüche

1. Organische Leuchtdiodenanzeige (101), umfassend:

ein Substrat (18), wo organische Leuchtdioden (L1) ausgebildet sind; und

ein Verkapselungselement (22, 52), das auf dem Substrat (18) befestigt ist und die organischen Leuchtdioden (L1) überdeckt, wobei das Verkapselungselement (22, 52) ein photochromes Material (42) umfasst, sodass das Verkapselungselement (22, 52) durch externes Licht gefärbt wird,

dadurch gekennzeichnet, dass

in einem Überlappungsbereich des Substrats (18) und des Verkapselungselements (22, 52) ein Photosensor (44) angeordnet ist, wobei der Photosensor (44) so gestaltet ist, dass er eine Änderung von externem Licht, welches das Verkapselungselement (22, 52) passiert, erkennt.

2. Organische Leuchtdiodenanzeige nach Anspruch 1, wobei das Substrat (18) ein Halbleitersubstrat ist und das Verkapselungselement (22, 52) ein Verkapselungssubstrat ist.
3. Organische Leuchtdiodenanzeige nach Anspruch 2, wobei das Verkapselungssubstrat (22, 52) aus Glas ausgebildet ist.
4. Organische Leuchtdiodenanzeige nach einem der Ansprüche 1 bis 2, wobei das Verkapselungselement (52) ein Dünnschicht-Verkapselungselement

ist, das eine Mehrzahl anorganischer Schichten (521) und eine Mehrzahl organischer Schichten (522), die wechselweise gestapelt sind, umfasst.

5. Organische Leuchtdiodenanzeige nach Anspruch 4, wobei mindestens eine aus der Mehrzahl anorganischer Schichten (521) und der Mehrzahl organischer Schichten (522) das photochrome Material (42) umfasst.
6. Organische Leuchtdiodenanzeige nach einem der Ansprüche 4 und 5, wobei die vom Substrat (18) am weitesten entfernte Schicht aus der Mehrzahl anorganischer Schichten (521) und der Mehrzahl organischer Schichten (522) das photochrome Material (42) umfasst.
7. Organische Leuchtdiodenanzeige nach einem der Ansprüche 4 bis 6, wobei die anorganische Schicht (521) aus Aluminiumoxid oder Silikonoxid ausgebildet ist und/oder die organische Schicht (522) aus Epoxid, Acrylat oder Urethanacrylat ausgebildet ist.
8. Organische Leuchtdiodenanzeige nach einem der vorherigen Ansprüche, wobei das photochrome Material (42) Silberhalid, Zinkhalid, Kadmiumhalid, Kupferhalid oder Magnesiumhalid umfasst.
9. Organische Leuchtdiodenanzeige nach einem der Ansprüche 1 bis 7, wobei das photochrome Material (42) Spiropyran, Spironaphthoxazin-Farbstoff, Diarylethen-Derivate, Dehydropyridin, Furylfulgid-Derivate oder Azobenzol-Derivate umfasst.
10. Organische Leuchtdiodenanzeige nach einem der Ansprüche 1 bis 9, ferner umfassend:
 - einen Analog-Digital-Wandler (46), der so gestaltet ist, dass er ein vom Photosensor (44) ausgegebenes analoges Signal empfängt und das analoge Signal in ein digitales Signal umwandelt; und
 - einen Datentreiber (48), der so gestaltet ist, dass er das vom Analog-Digital-Wandler (46) ausgegebene digitale Signal empfängt und eine Datenspannung bereitstellt, die einem Färbungsgrad des Verkapselungselements (22, 52) entspricht, wobei der Datentreiber (48) ferner eine Gammasteuerung (50) umfasst, die eine Mehrzahl von Gammakurven aufweist, die jeweils dem Färbungsgrad des Verkapselungselements (22, 52) entsprechen.
11. Organische Leuchtdiodenanzeige nach Anspruch 10, wobei die Datenspannung mit Hilfe eines in der Gammasteuerung (50) gespeicherten Datenspannungseinstellwertes an die Paneelanordnung (12) geleitet wird.

12. Organische Leuchtdiodenanzeige nach einem der vorherigen Ansprüche 1 bis 3 oder 8 bis 11, wobei das Verkapselungselement (22, 52) aus einem Glassubstrat ausgebildet ist und das photochrome Material (42) in das Glassubstrat eingelassen ist.
13. Organische Leuchtdiodenanzeige nach einem der vorherigen Ansprüche, wobei das photochrome Material (42) gleichmäßig innerhalb des Verkapselungselements (22, 52) verteilt ist.
14. Organische Leuchtdiodenanzeige nach einem der vorherigen Ansprüche, wobei das photochrome Material (42) aus runden Partikeln besteht.

Revendications

1. Écran (101) à diodes électroluminescentes organiques, comprenant :

un substrat (18) où sont formées des diodes électroluminescentes organiques (L1) ; et un organe (22, 52) d'encapsulation qui est fixé sur le substrat (18) tout en recouvrant les diodes électroluminescentes organiques (L1), dans lequel l'organe (22, 52) d'encapsulation comprend une matière photochromique (42) de sorte que l'organe d'encapsulation (22, 52) est coloré par de la lumière externe, **caractérisé en ce qu'un** photodétecteur (44) est disposé dans une zone en chevauchement du substrat (18) et de l'organe (22, 52) d'encapsulation, le photodétecteur (44) étant apte à détecter un changement de la lumière externe passant à travers l'organe (22, 52) d'encapsulation.

2. Écran à diodes électroluminescentes organiques selon la revendication 1, dans lequel le substrat (18) et un substrat semi-conducteur, et l'organe (22, 52) d'encapsulation est un substrat d'encapsulation.
3. Écran à diodes électroluminescentes organiques selon la revendication 2, dans lequel le substrat (22, 52) d'encapsulation est fait de verre.
4. Écran à diodes électroluminescentes organiques selon l'une des revendications 1 et 2, dans lequel l'organe (52) d'encapsulation est une couche d'encapsulation à films minces comprenant une pluralité de couches inorganiques (521) et une pluralité de couches organiques (522) qui sont empilées de manière alternée.
5. Écran à diodes électroluminescentes organiques selon la revendication 4, dans lequel au moins l'une de la pluralité de couches inorganiques (521) et de la pluralité de couches organiques (522) comprend la

matière photochromique (42).

6. Écran à diodes électroluminescentes organiques selon l'une des revendications 4 et 5, dans lequel la couche la plus éloignée du substrat (18) parmi la pluralité de couches inorganiques (521) et la pluralité de couches organiques (522) inclut la matière photochromique (42).
7. Écran à diodes électroluminescentes organiques selon l'une quelconque des revendications 4 à 6, dans lequel la couche inorganique (521) est faite de l'un choisi dans un groupe constitué de l'oxyde d'aluminium et de l'oxyde de silicium, et/ou la couche organique (522) est faite de l'un choisi dans un groupe constitué d'époxy, d'acrylate et d'acrylate d'uréthane.
8. Écran à diodes électroluminescentes organiques selon l'une quelconque des revendications précédentes, dans lequel la matière photochromique (42) comprend l'un choisi dans un groupe constitué d'halogénure d'argent, d'halogénure de zinc, d'halogénure de cadmium, d'halogénure de cuivre et d'halogénure de magnésium.
9. Écran à diodes électroluminescentes organiques selon l'une quelconque des revendications 1 à 7, dans lequel la matière photochromique (42) comprend l'un choisi dans un groupe constitué de spiropyranne, de colorant à base de spironaphthoxazine, de dérivés de diaryléthène, de déshydropyridine, de dérivés de furylfulgide et de dérivés d'azobenzène.
10. Écran à diodes électroluminescentes organiques selon l'une quelconque des revendications 1 à 9, comprenant en outre :
- un convertisseur d'analogique en numérique (46) apte à recevoir un signal analogique sorti du photodétecteur (44), et apte à convertir le signal analogique en un signal numérique ; et un circuit d'attaque (48) de données apte à recevoir le signal analogique sorti du convertisseur d'analogique en numérique (46), et apte à fournir une tension de donnée qui correspond à un degré de coloration de l'organe (22, 52) d'encapsulation, dans lequel le circuit d'attaque (48) de donnée comprend en outre un régulateur (50) de gamma incluant une pluralité de courbes de gamma qui correspondent respectivement au degré de coloration de l'organe (22, 52) d'encapsulation.
11. Écran à diodes électroluminescentes organiques selon la revendication 10, dans lequel la tension de donnée est fournie à l'assemblage (12) de panneau en utilisant une valeur de paramétrage de tension

de donnée mémorisée dans le régulateur (50) de gamma.

- 12.** Écran à diodes électroluminescentes organiques selon l'une quelconque des revendications 1 à 3 ou 8 à 11 précédentes, dans lequel l'organe (22, 52) d'encapsulation est fait d'un substrat de verre et la matière photochromique (42) est noyée dans le substrat de verre. 5 10
- 13.** Écran à diodes électroluminescentes organiques selon l'une quelconque des revendications précédentes, dans lequel la matière photochromique (42) est dispersée uniformément à l'intérieur de l'organe (22, 52) d'encapsulation. 15
- 14.** Écran à diodes électroluminescentes organiques selon l'une quelconque des revendications précédentes, dans lequel la matière photochromique (42) est constituée de particules rondes. 20

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FIG.1

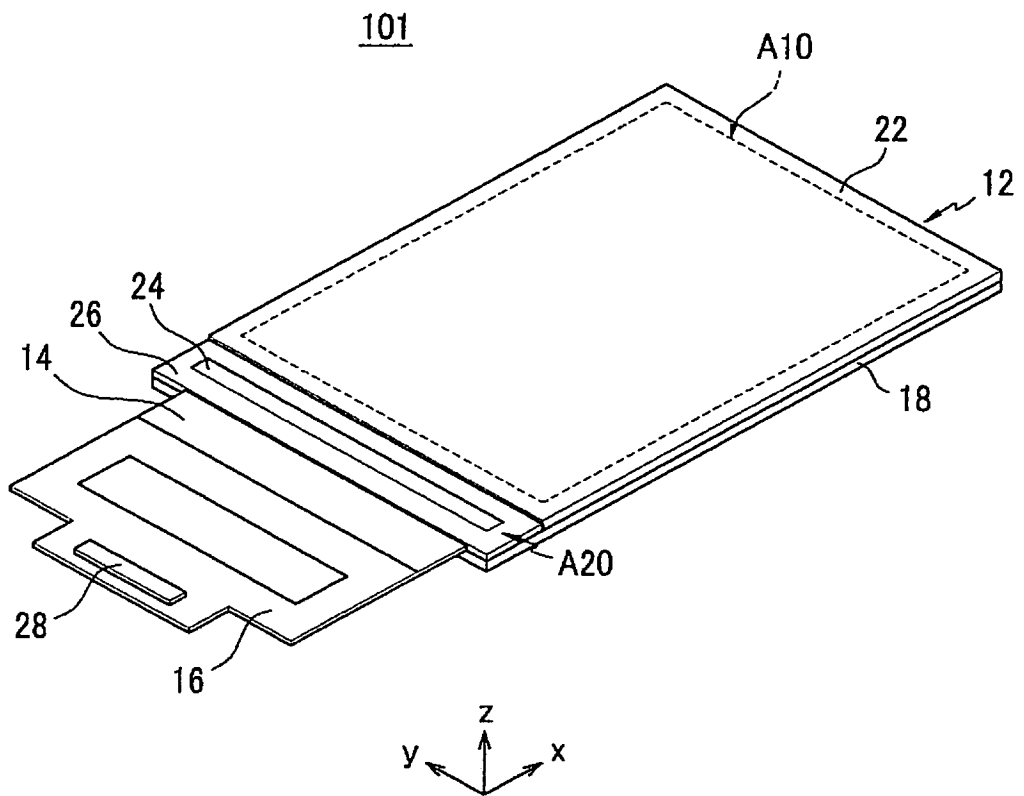


FIG.2

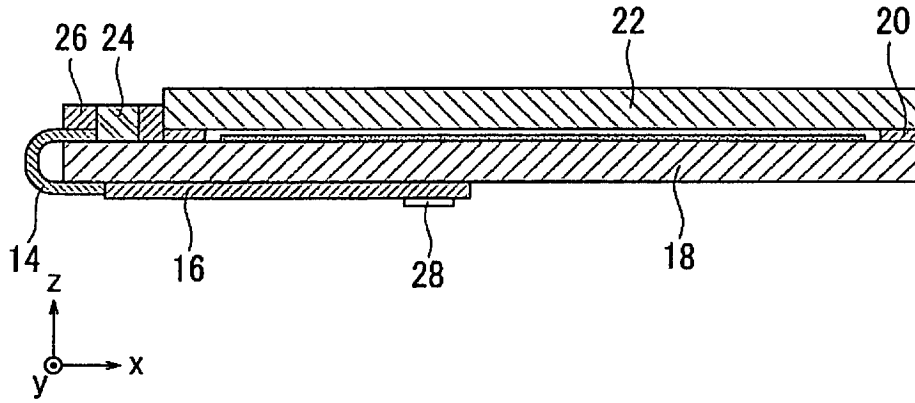


FIG.3

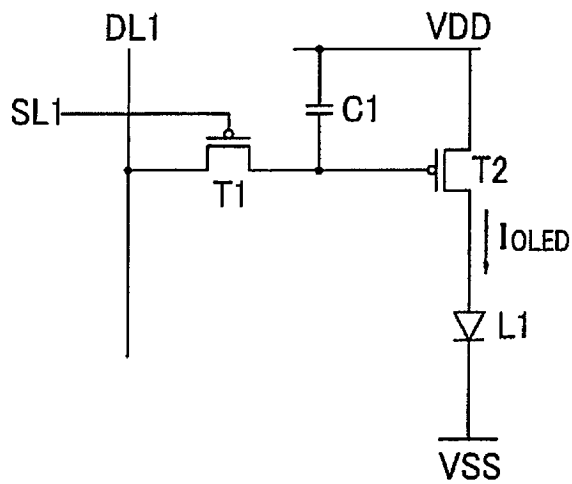


FIG.4

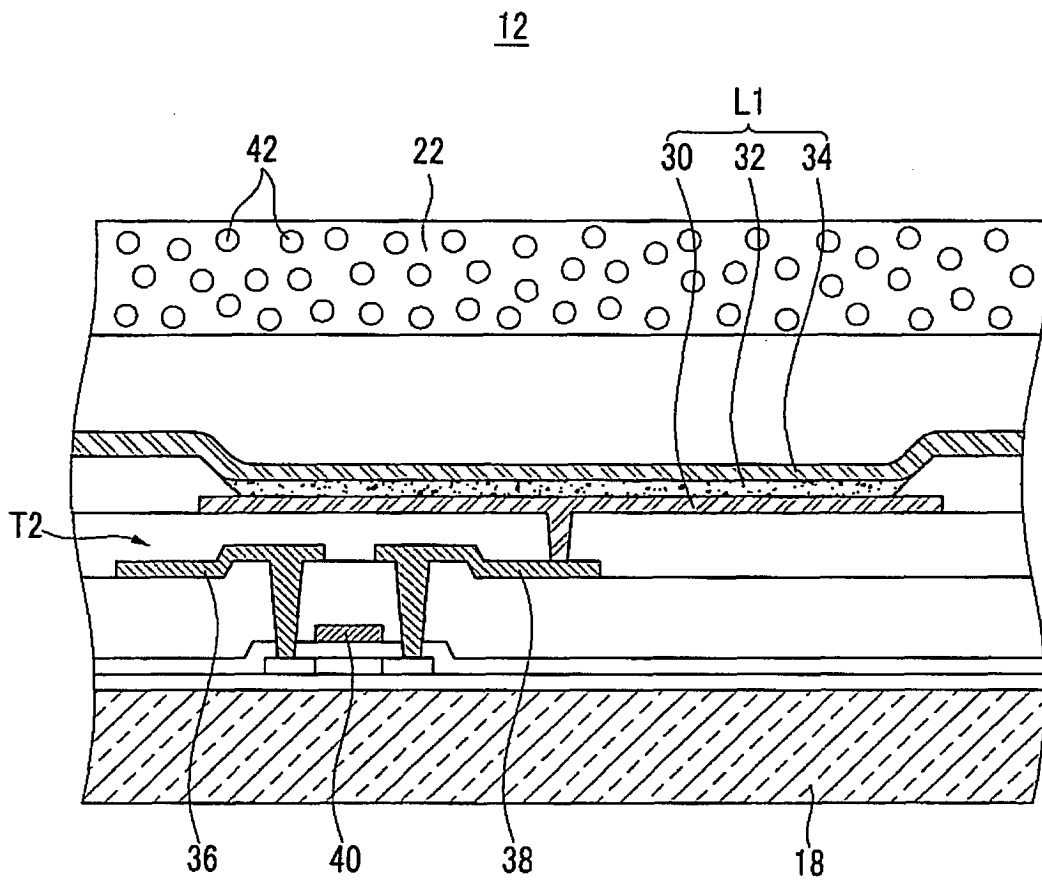


FIG.5

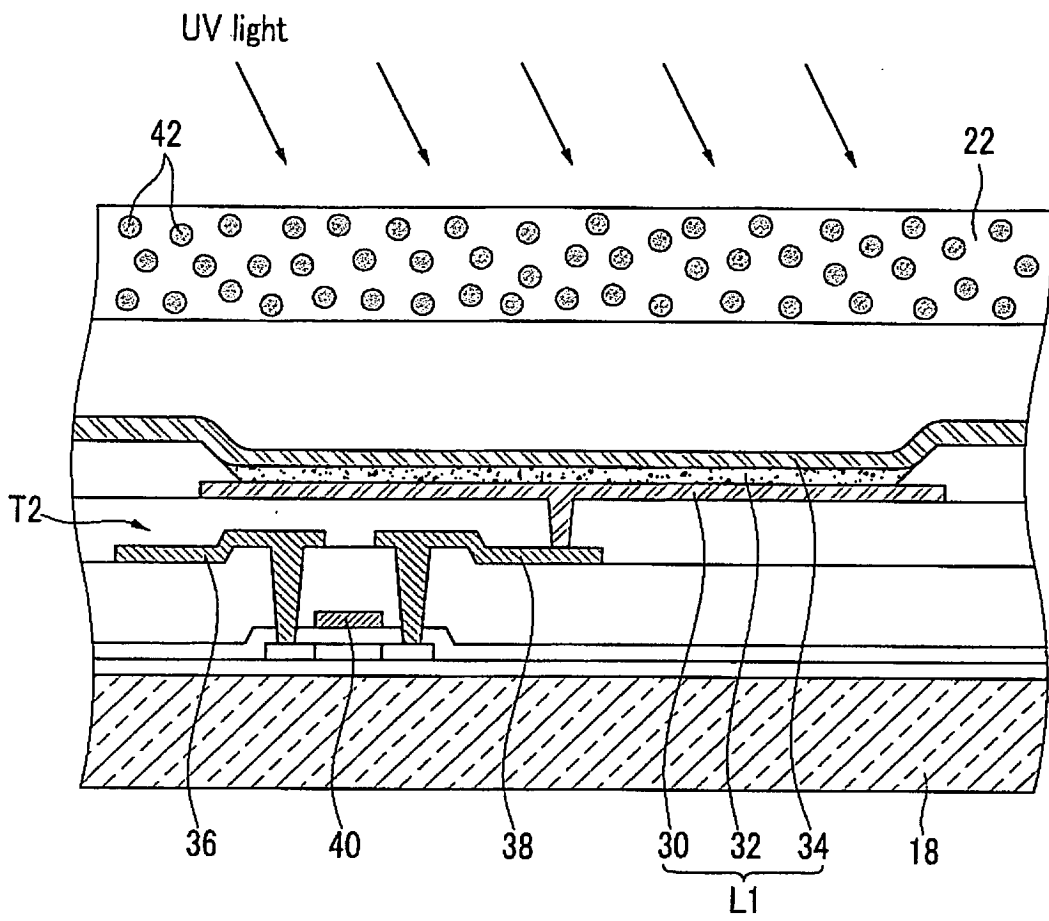


FIG. 7

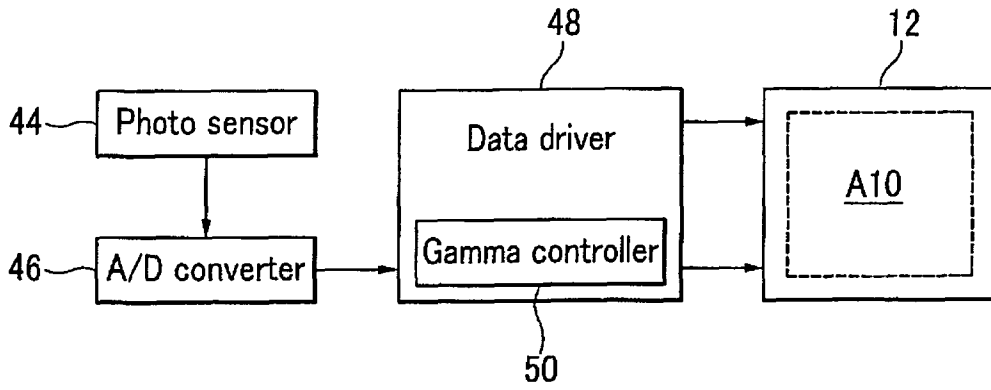


FIG. 8

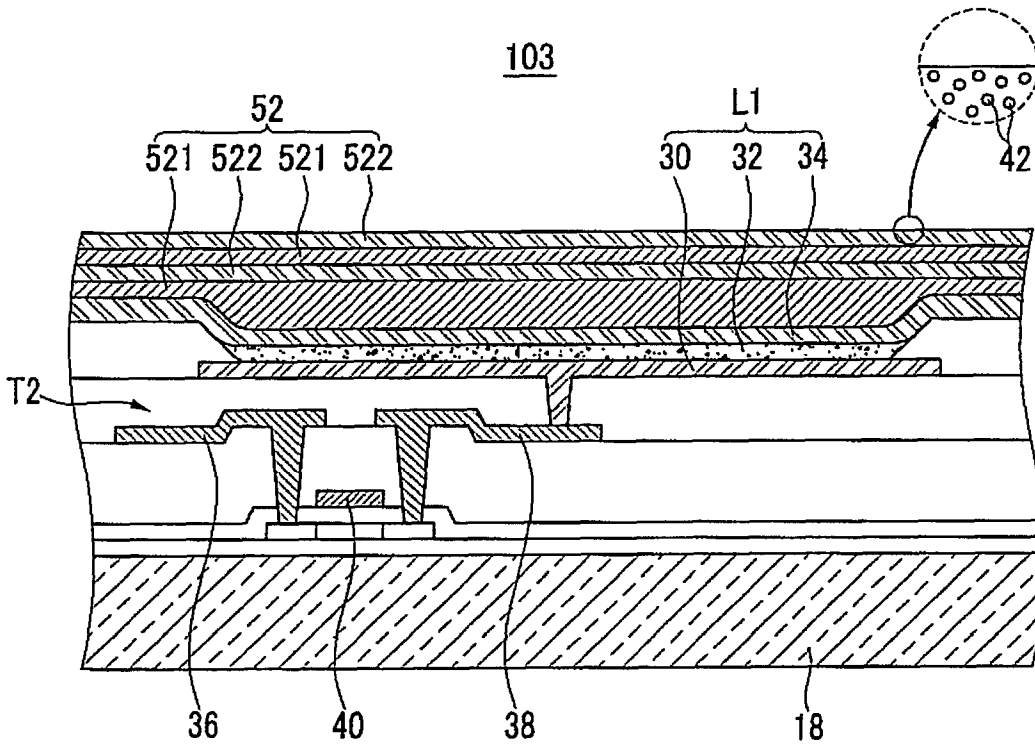
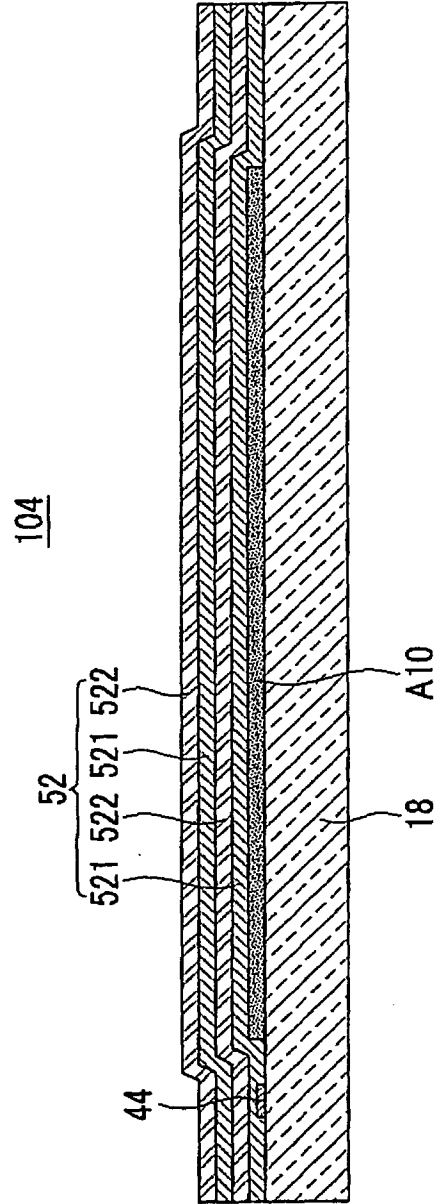


FIG.9



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- EP 1164641 A2 [0005]

专利名称(译)	有机发光二极管显示器		
公开(公告)号	EP2202820B1	公开(公告)日	2012-05-16
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[标]申请(专利权)人(译)	三星显示有限公司		
申请(专利权)人(译)	三星移动显示器有限公司.		
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摘要(译)

有机发光二极管 (OLED) 显示器包括其中形成OLED的基板和固定到基板上同时覆盖OLED的封装构件。封装构件包括光致变色材料，使得封装构件通过外部光着色。

FIG. 1

