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(54) **ORGANIC LIGHT EMITTING DISPLAY DEVICE AND METHOD OF MANUFACTURING ORGANIC LIGHT EMITTING DISPLAY DEVICE**

(75) Inventors: **Min-Ho OH**, Yongin-city (KR); **Yoon-Hyeong CHO**, Yongin-city (KR); **Byoung-Duk LEE**, Yongin-city (KR); **So-Young LEE**, Yongin-city (KR); **Sun-Young LEE**, Yongin-city (KR); **Jong-Hyuk LEE**, Yongin-city (KR)

(73) Assignee: **SAMSUNG MOBILE DISPLAY CO., LTD.**,, Yongin-city (KR)

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(57) **ABSTRACT**

There is provided an organic light emitting display device including a first substrate; an organic light emitting unit formed on the first substrate; a second substrate disposed on the organic light emitting unit; and an adhesive unit for adhering the first substrate and the second substrate to each other, wherein the adhesive unit includes a sealant, and particles that are arranged in the sealant so as to block penetration of external impurities. There is further provided a method of manufacturing the organic light emitting display device.

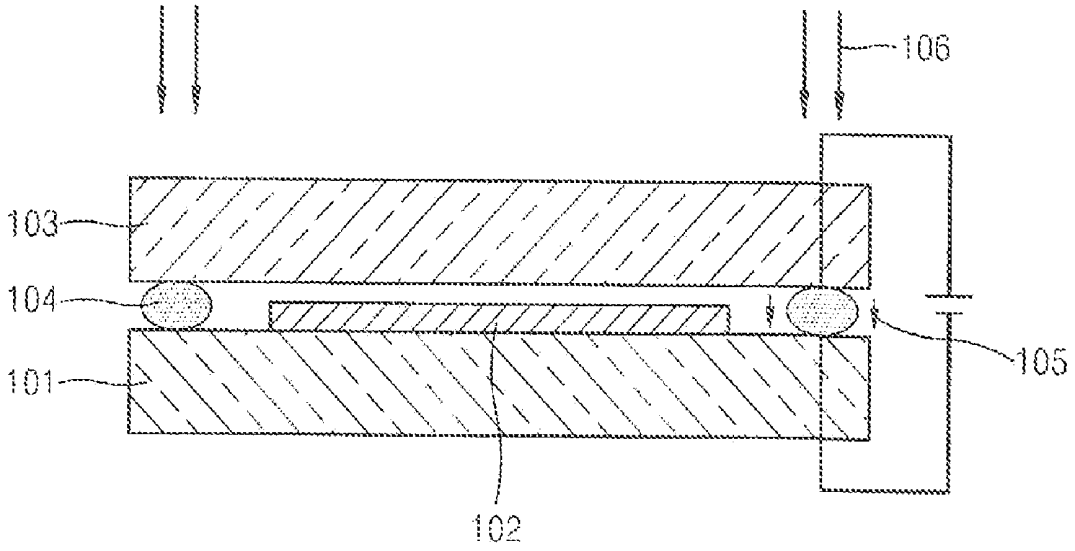


FIG. 1

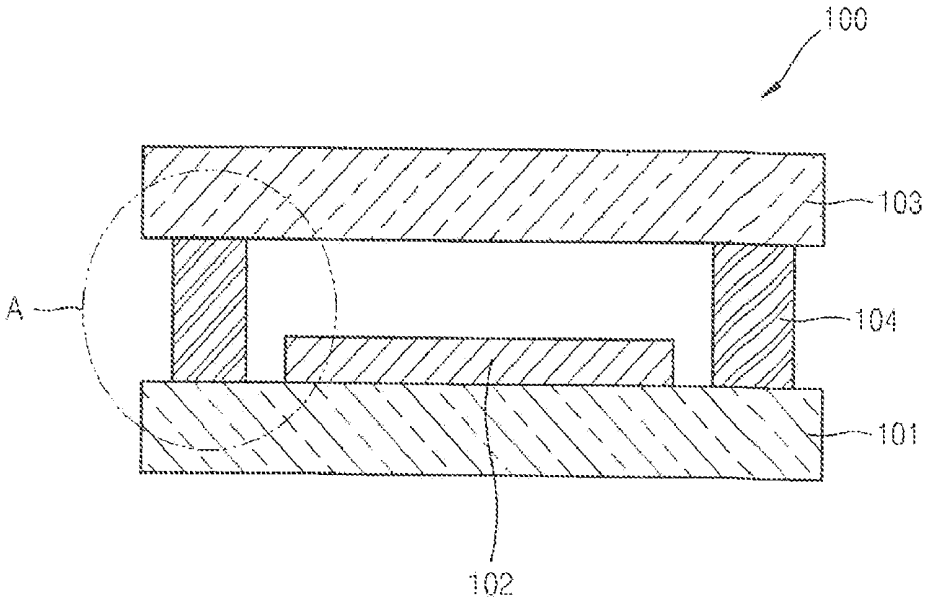


FIG. 2

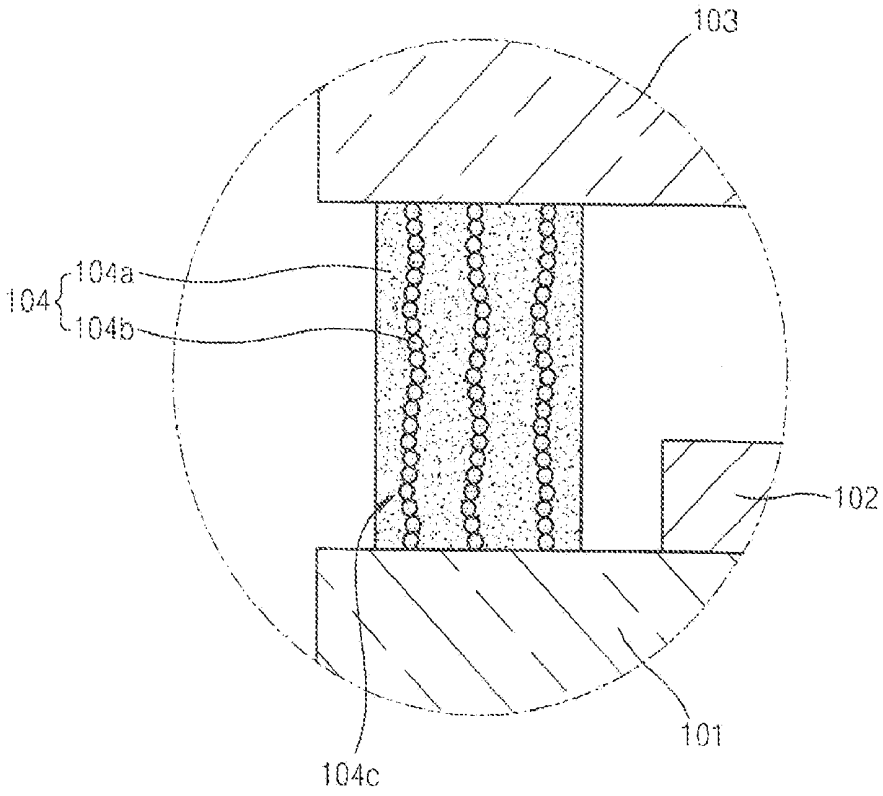


FIG. 3

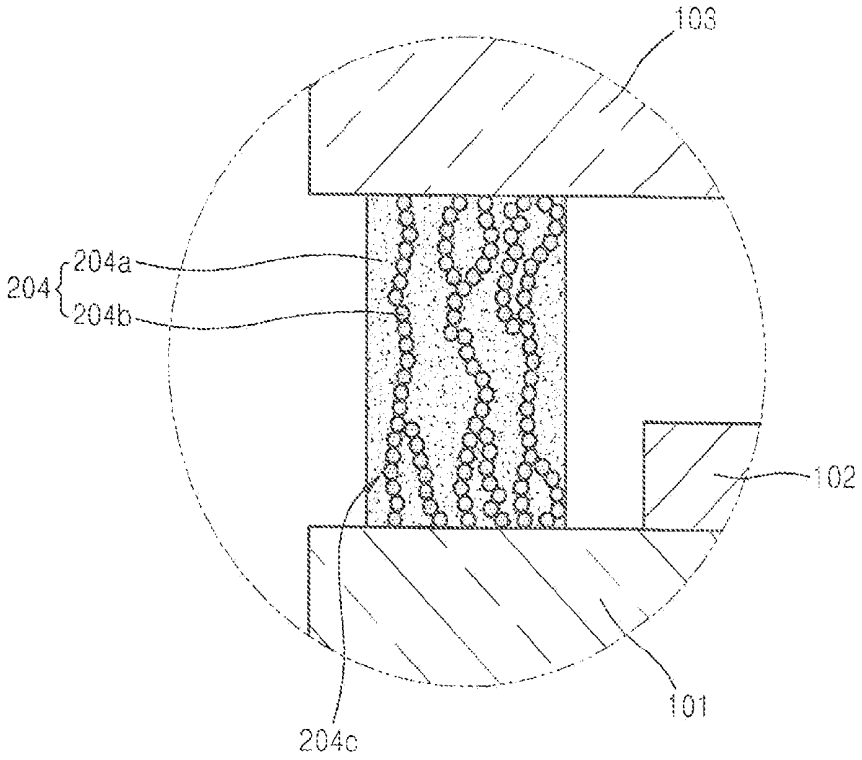

103
204
204a
204b
102
101
204c

FIG. 4

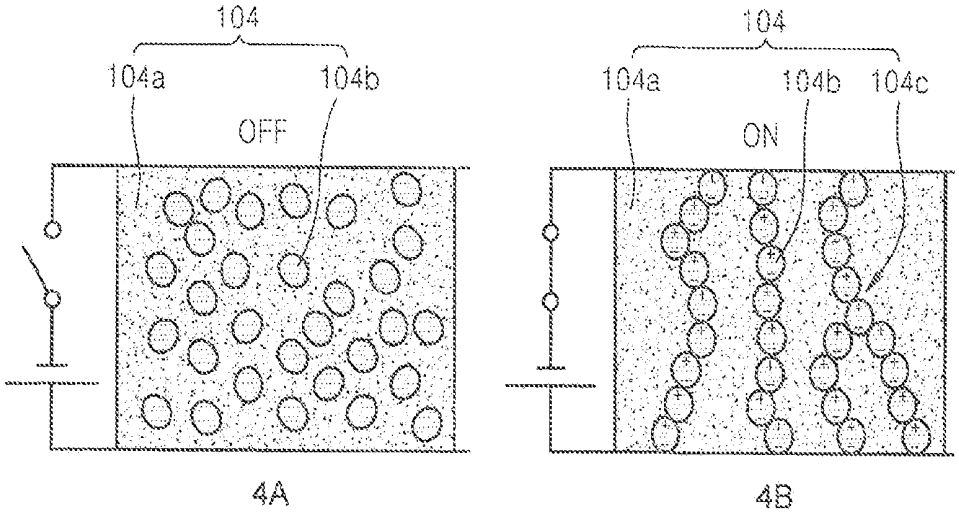

104
104a
104b
OFF
4A
104
104a
104b
104c
ON
4B

FIG. 5

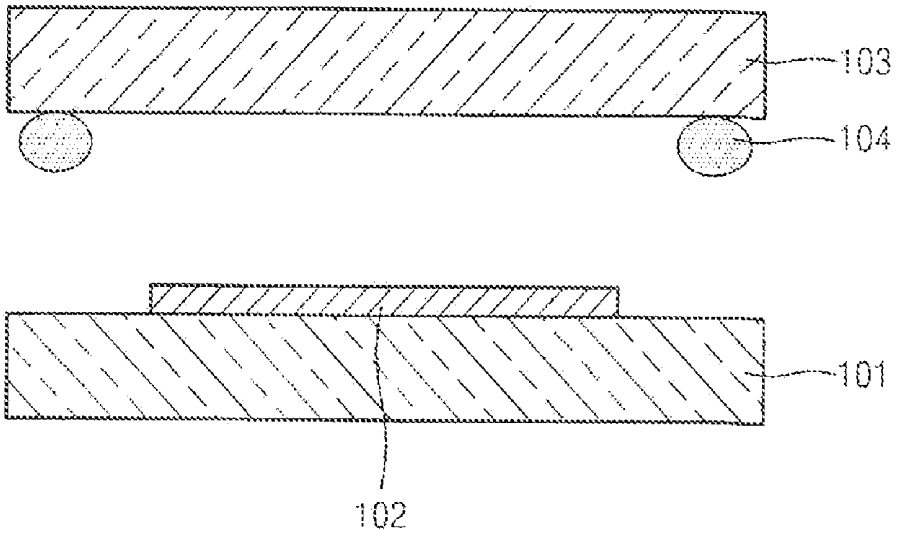


FIG. 6

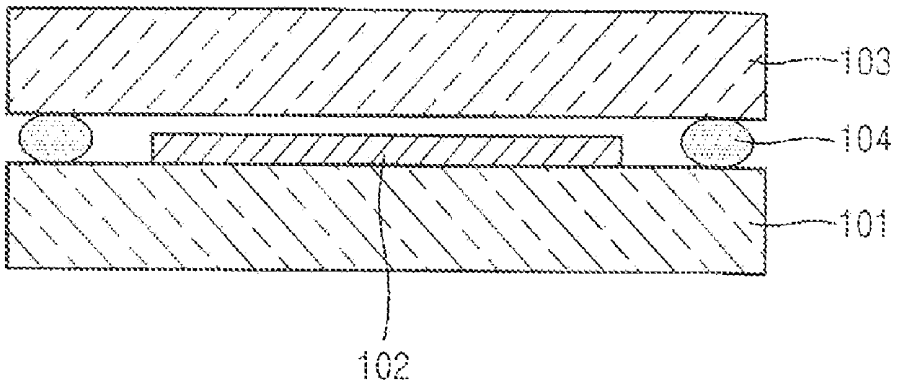


FIG. 7

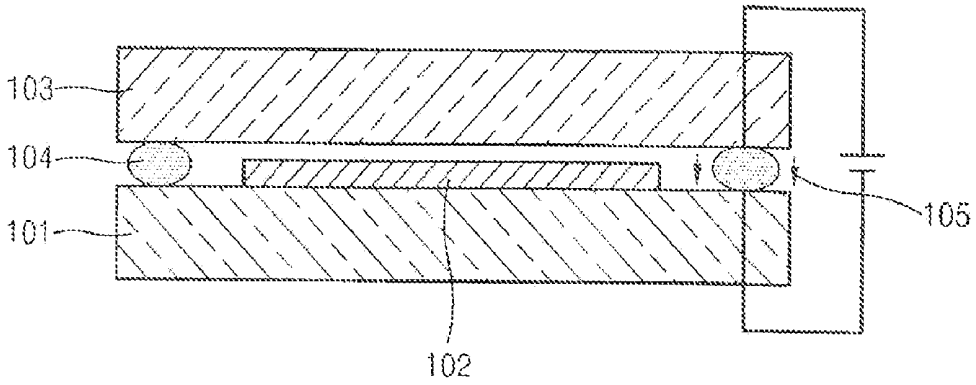
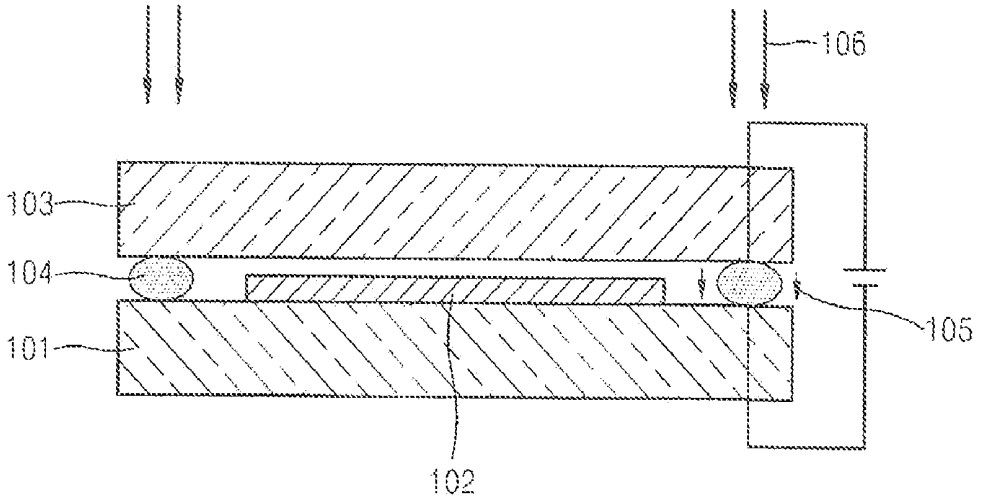


FIG. 8



ORGANIC LIGHT EMITTING DISPLAY DEVICE AND METHOD OF MANUFACTURING ORGANIC LIGHT EMITTING DISPLAY DEVICE

CROSS-REFERENCE TO RELATED PATENT APPLICATION

[0001] This application claims the benefit of Korean Patent Application No. 10-2009-0119907, filed on Dec. 4, 2009, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to an organic light emitting display device and a method of manufacturing the organic light emitting display device, and more particularly, to an organic light emitting display device for preventing the penetration of external moisture and other external impurities, and a method of manufacturing the organic light emitting display device.

[0004] 2. Discussion of Related Art

[0005] Generally, a flat display device may be largely classified into a light emitting type flat display device and a light receiving type flat display device. Examples of the light emitting type flat display device may include a flat cathode ray tube, a plasma display panel, an electro luminescent device, and a light emitting diode. Examples of the light receiving type flat display device may include a liquid crystal display device. The electro luminescent device has a wide viewing angle, excellent contrast, and fast response speed, and thus the electro luminescent device is attracting attention as the next generation of display devices. The electro luminescent device is classified into an inorganic electro luminescent device and an organic electro luminescent device according to the material used to form the electro luminescent device.

[0006] The organic electro luminescent device is a self-emissive device that emits light by electrically exciting a fluorescent organic compound, is driven by a low voltage, is easily miniaturized, and has a wide viewing angle and fast response speed. Since these characteristics are related to problems to be overcome in the liquid crystal display device, the organic electro luminescent device is attracting attention as the next generation of display devices.

[0007] The organic electro luminescent device includes an emission layer (EML) formed of an organic material and disposed between an anode and a cathode. In the organic electro luminescent device, when an anode voltage and a cathode voltage are applied to the anode and the cathode, respectively, a hole injected from the anode is moved to the EML via a hole transport layer (HTL), an electron is moved from the cathode to the EML via an electron transport layer (ETL), and the hole and the electron recombine in the EML to generate excitons.

[0008] As the excitons change from an excitation state to a ground state, a fluorescence molecule of the EML emits light to form an image. A full color type organic electro luminescent device includes a pixel exhibiting three colors of red (R), green (G) and blue (B), thereby realizing full-color.

[0009] The full color type organic electro luminescent device includes pixel define layers on both ends of an anode. A predetermined opening is formed in the pixel define layer, and then an EML and a cathode are sequentially formed on a portion of the anode, which is exposed from the opening of the pixel define layer.

SUMMARY OF THE INVENTION

[0010] According to an aspect of the present invention, there is provided an organic light emitting display device including a first substrate; an organic light emitting unit formed on the first substrate; a second substrate disposed on the organic light emitting unit; and an adhesive unit for adhering the first substrate and the second substrate to each other, wherein the adhesive unit includes a sealant, and particles that are arranged in the sealant so as to block penetration of external impurities.

[0011] The particles may be arranged in a direction from the first substrate towards the second substrate.

[0012] The particles may form a plurality of blocking units that are each arranged in a column in a direction from the first substrate towards the second substrate.

[0013] The particles may be arranged in a chained shape in a direction from the first substrate towards the second substrate.

[0014] The particles may include a material having polarization characteristics in the sealant due to an electric field or a magnetic field.

[0015] The particles may include an organic material having polarization characteristics.

[0016] The organic material may be one selected from the group consisting of polyaniline, polypyrrole, poly (p-phenylene), poly naphthalene quinine radicals, poly acene quinone radicals, poly phenylenediamine, and polythiophene.

[0017] The particles may include an inorganic material having polarization characteristics.

[0018] The inorganic material may be one selected from the group consisting of silica gel, silica, zeolite, and a mesoporous material.

[0019] The sealant may include an insulating material.

[0020] The sealant may include one selected from the group consisting of silicon, epoxy, and acryl.

[0021] According to another aspect of the present invention, there is provided a method of manufacturing an organic light emitting display device, including forming an organic light emitting unit on a first substrate; coating an adhesive unit on a second substrate; adhering the first substrate and the second substrate to each other so that the adhesive unit surrounds the organic light emitting unit; applying an electric field or a magnetic field to the adhesive unit; and hardening the adhesive unit so as to adhere the first substrate and the second substrate to each other.

[0022] The adhesive unit may include a sealant, and particles that are dispersed in the sealant.

[0023] The particles may have polarization characteristics.

[0024] The application of the electric field or the magnetic field may include applying the electric field or the magnetic field in a direction from the first substrate towards the second substrate, or applying the electric field or the magnetic field in a direction from the second substrate towards the first substrate; and arranging the particles in a direction of the electric field or the magnetic field.

[0025] The particles may form a plurality of blocking units that are each arranged in a column in a direction from the first substrate towards the second substrate.

[0026] The particles may be arranged in a chained shape in a direction from the first substrate towards the second substrate.

[0027] The particles may include an organic material having polarization characteristics.

[0028] The organic material may be one selected from the group consisting of polyaniline, polypyrrole, poly(p-phenylene), poly naphthalene quinine radicals, poly acene quinone radicals, poly phenylenediamine, and polythiophene.

[0029] The particles may include an inorganic material having polarization characteristics.

[0030] The inorganic material may be one selected from the group consisting of silica gel, silica, zeolite, and a mesoporous material.

[0031] The sealant may include an insulating material.

[0032] The sealant may include one selected from the group consisting of silicon, epoxy, and acryl.

[0033] The hardening of the adhesive unit may be performed by heating the adhesive unit.

[0034] The hardening of the adhesive unit may be performed by applying ultraviolet rays to the adhesive unit.

[0035] The hardening of the adhesive unit may be performed when the electric field or the magnetic field is applied to the adhesive unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] 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:

[0037] FIG. **1** is a cross-sectional view of an organic light emitting display device according to an embodiment of the present invention;

[0038] FIG. **2** is an enlarged diagram of a portion 'A' of FIG. **1**, according to an embodiment of the present invention;

[0039] FIG. **3** is a schematic cross-sectional view of an adhesive unit of the organic light emitting display device of FIG. **1**, according to another embodiment of the present invention;

[0040] FIGS. **4**A and **4**B show arrangements of particles, according to embodiments of the present invention; and

[0041] FIGS. **5** through **8** are cross-sectional views of a method of manufacturing an organic light emitting display device, according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0042] The present invention will now be described more fully with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown.

[0043] FIG. **1** is a cross-sectional view of an organic light emitting display device **100** according to an embodiment of the present invention. FIG. **2** is an enlarged diagram of a portion 'A' of FIG. **1**, according to an embodiment of the present invention. FIG. **3** is a schematic cross-sectional view of an adhesive unit **104** of the organic light emitting display device **100** of FIG. **1**, according to another embodiment of the present invention.

[0044] Referring to FIG. **1**, the organic light emitting display device **100** may include a first substrate **101**, an organic light emitting unit **102**, a second substrate **103** and an adhesive unit **104**.

[0045] The organic light emitting unit **102** includes an organic light emitting device and is disposed on the first substrate **101**. Various plastic substrates as well as a glass substrate may be used as the first substrate **101**. In addition, a metallic substrate may be used as the first substrate **101**. If necessary, a buffer layer (not shown) may be disposed on the first substrate **101**.

[0046] The organic light emitting unit **102** may include a plurality of organic light emitting devices. The organic light emitting device of the organic light emitting unit **102** includes a pixel electrode, a counter electrode facing the pixel electrode, and an intermediate layer including at least one emission layer (EML) interposed between the pixel electrode and the counter electrode. The pixel electrode may be used as a transparent electrode or a reflective electrode. When the pixel electrode is used as a transparent electrode, the pixel electrode may be formed of at least one selected from the group consisting of ITO, IZO, ZnO and In_2O_3. When the pixel electrode is used as a reflective electrode, the pixel electrode may include a reflective layer formed of one selected from the group consisting of Ag, Mg, Al, Pt, Pd, Au, Ni, Nd, Ir, Cr and combinations thereof, and a layer formed of at least one selected from the group consisting of ITO, IZO, ZnO and In_2O_3 and disposed on the reflective layer. The counter electrode may be used as a transparent layer or a reflective layer. When the counter electrode is used as a transparent electrode, the counter electrode may include a layer formed of one selected from the group consisting of Li, Ca, LiF/Ca, LiF/Al, Al, Mg and combinations thereof and formed to face the intermediate layer formed between the pixel electrode and the counter electrode, and an auxiliary electrode or bus electrode line that is formed on the layer and is formed of a material for a transparent electrode, such as ITO, IZO, ZnO and In_2O_3. When the counter electrode is used as a reflective electrode, the counter electrode may be formed by depositing one selected from the group consisting of Li, Ca, LiF/Ca, LiF/Al, Al, Mg and combinations thereof. The intermediate layer formed between the pixel electrode and the counter electrode may be formed of a small molecular weight organic material or a polymer organic material. When the intermediate layer is formed of a small molecular weight organic material, the intermediate layer may be formed by stacking a hole injection layer (HIL), a hole transport layer (HTL), an emission layer (EML), an electron transport layer (ETL), and an electron injection layer (EIL) in a single or complex structure. An organic material used for forming the intermediate layer may be copper phthalocyanine (CuPc), N,N'-Di(naphthalene-1-yl)-N,N'-diphenyl-benzidine (NPB), tris-8-hydroxyquinoline aluminum (Alq3), or the like. The intermediate layer may be formed of a small molecular weight organic material by using a vacuum deposition method. When the intermediate layer is formed of a polymer organic material, the intermediate layer may include a structure including a HTL and an EML. In this case, the HTL may be formed of poly-(2,4)-ethylene-dihydroxy thiophene (PEDOT). In addition, the EML may be formed of a polymer organic material such as poly-phenylenevinylene (PPV), and polyfluorene.

[0047] The second substrate **103** is disposed on the first substrate **101** so as to cover the organic light emitting unit **102**. Various plastic substrates such as an acrylic substrate as well as a glass substrate may be used as the second substrate **103**.

[0048] The adhesive unit **104** is disposed between the first substrate **101** and the second substrate **103** so as to adhere the

first substrate **101** and the second substrate **103** to each other. The adhesive unit **104** may be disposed between the first substrate **101** and the second substrate **103** so as to surround the organic light emitting unit **102** formed on the first substrate **101**. The adhesive unit **104** may include a sealant **104***a* and particles **104***b*.

[0049] The particles **104***b* may form at least one arrangement in the sealant **104***a*. As shown in FIG. **2**, the particles **104***b* may form at least one blocking unit **104***c* that is arranged in a column. According to another embodiment of the present invention, as shown in FIG. **3**, particles **204***b* may form a blocking unit **204***c* that is arranged in a chained shape. The particles **104***b* and **204***b* may be arranged in a direction from the first substrate **101** towards the second substrate **103** in the sealants **104***a* and **204***a* so as to form the blocking units **104***c* and **204***c*, respectively.

[0050] The sealants **104***a* and **204***a* may be formed any one of silicon, epoxy, acryl, and the like. The particles **104***b* and **204***b* may include an organic or inorganic material having polarization characteristics. Examples of the organic material having polarization characteristics and for forming the particles **104***b* and **204***b* may include polyaniline, polypyrrole, poly(p-phenylene), poly naphthalene quinine radicals, poly acene quinone radicals, poly phenylenediamine, and polythiophene. Examples of the inorganic material used for forming the particles **104***b* and **204***b* may include silica gel, silica, zeolite, and a mesoporous material.

[0051] The particles **104***b* and **204***b* may be arranged in a direction from the first substrate **101** towards the second substrate **103** (or in a direction from the second substrate **103** towards the first substrate **101**) to form at least one of the blocking units **104***c* and **204***c*, respectively, thereby preventing external moisture and other external impurities from penetrating into the organic light emitting unit **102** through the sealants **104***a* and **204***a*.

[0052] FIGS. **4**A and **4**B show arrangements of the particles **104***b* and **204***b*, according to embodiments of the present invention. FIG. **4**A shows a case where an electric field is not applied to the adhesive unit **104**, according to an embodiment of the present invention. FIG. **4**B shows a case where an electric field is applied to the adhesive unit **104**, according to another embodiment of the present invention.

[0053] Referring to FIG. **4**A, when an electric field or a magnetic field is not applied, the particles **104***b* of the adhesive unit **104** are dispersed in the sealant **104***a*. That is, the particles **104***a* are not regularly arranged, and exist randomly in the sealant **104***a*. However, as shown in FIG. **4**B, when an electric field or a magnetic filed is applied to the adhesive unit **104**, the particles **104***b* of the sealant **104***a* are polarized so as to be arranged according to a direction of the electric field or the magnetic field. That is, when an electric field is applied to the adhesive unit **104**, the particles **104***b* are polarized each with a positive (+) polarity and a negative (−) polarity, the positive (+) polarity and the negative (−) polarity contact each other, and thus forming the blocking units **104***c* arranged along a direction of the electric field. Although not illustrated in FIGS. **4**A and **4**B, when a magnetic field is not applied, the particles **104***b* are polarized each with an N polarity and an S polarity, the N polarity and the S polarity contact each other, and thus forming the particles **104***b* that may be arranged along a direction of the magnetic field.

[0054] FIGS. **5** through **8** are cross-sectional views of a method of manufacturing an organic light emitting display device, according to an embodiment of the present invention.

[0055] Referring to FIG. **5**, an organic light emitting unit **102** is formed on a first substrate **101**. In the case of an active matrix organic light emitting device (AMOLED), the organic light emitting unit **102** may be formed as a plurality of organic thin films including an EML formed on a thin film transistor (TFT).

[0056] An adhesive unit **104** may be coated on a second substrate **103**. When the first substrate **101** and the second substrate **103** are adhered to each other, the adhesive unit **104** may be coated on an edge portion of the second substrate **103** so as to surround the organic light emitting unit **102**.

[0057] Then, as shown in FIG. **6**, the first substrate **101** and the second substrate **103** are adhered to each other. The organic light emitting unit **102** is disposed between the first substrate **101** and the second substrate **103**, and the adhesive unit **104** surrounds an outer side of the organic light emitting unit **102**. In the current operation, particles of the adhesive unit **104** are randomly dispersed in a sealant.

[0058] Then, as shown in FIG. **7**, an electric field **105** is applied to the adhesive unit **104**. The particles of the adhesive unit **104** are polarized in a sealant by applying the electric field to the adhesive unit **104**, and the particles are arranged in a direction from the first substrate **101** towards the second substrate **103** (or in a direction from the second substrate **103** towards the first substrate **101**), which is a direction of the electric field so as to form at least one blocking unit. The penetration of external moisture and other external impurities into the organic light emitting unit **102** may be blocked by the blocking unit, thereby increasing the lifetime of the organic light emitting display device.

[0059] Lastly, as shown in FIG. **8**, when an electric field or a magnetic field is applied to the adhesive unit **104**, the adhesive unit **104** is hardened by applying heat or ultraviolet rays to the adhesive unit **104**. That is, by hardening the adhesive unit **104** in which the particles are arranged along a direction of the electric field or magnetic field, a state of the blocking unit in which the particles are regularly arranged may be maintained without the electric field or magnetic field.

[0060] According to embodiments of the present invention, in an organic light emitting display device and a method of manufacturing the organic light emitting display device, the penetration of external moisture and other external impurities into an organic light emitting unit may be blocked by a blocking unit, thereby increasing the lifetime of the organic light emitting display device.

[0061] 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 spirit and scope of the present invention as defined by the following claims.

What is claimed is:

1. An organic light emitting display device comprising:

a first substrate;

an organic light emitting unit formed on the first substrate;

a second substrate disposed on the organic light emitting unit; and

an adhesive unit for adhering the first substrate and the second substrate to each other,

wherein the adhesive unit comprises a sealant, and particles that are arranged substantially linearly in the sealant so as to block penetration of external impurities.

2. The organic light emitting display device of claim 1, wherein the particles are arranged in a direction generally perpendicular to the first substrate and the second substrate.

3. The organic light emitting display device of claim 2, wherein the particles form a plurality of linearly arranged chains that are each arranged in a direction generally perpendicular to the first substrate and the second substrate.

4. The organic light emitting display device of claim 1, wherein the particles are linearly arranged end to end between the first substrate and the second substrate.

5. The organic light emitting display device of claim 1, wherein the particles comprise a polarizable material in the sealant due to an electric field or a magnetic field.

6. The organic light emitting display device of claim 5, wherein the particles comprise a polarizable organic material.

7. The organic light emitting display device of claim 6, wherein the organic material is one selected from the group consisting of polyaniline, polypyrrole, poly(p-phenylene), poly naphthalene quinine radicals, poly acene quinone radicals, poly phenylenediamine, and polythiophene.

8. The organic light emitting display device of claim 5, wherein the particles comprise a polarizable inorganic material.

9. The organic light emitting display device of claim 8, wherein the inorganic material is one selected from the group consisting of silica gel, silica, zeolite, and a mesoporous material.

10. The organic light emitting display device of claim 1, wherein the sealant comprises an insulating material.

11. The organic light emitting display device of claim 10, wherein the sealant comprises one selected from the group consisting of silicon, epoxy, and acryl.

12. A method of manufacturing an organic light emitting display device, the method comprising:

forming an organic light emitting unit on a first substrate;

coating an adhesive unit on a second substrate;

adhering the first substrate and the second substrate to each other so that the adhesive unit surrounds the organic light emitting unit;

applying an electric field or a magnetic field to the adhesive unit; and

hardening the adhesive unit so as to adhere the first substrate and the second substrate to each other.

13. The method of claim 12, wherein the adhesive unit comprises a sealant, and particles that are dispersed in the sealant.

14. The method of claim 13, wherein the particles are polarizable.

15. The method of claim 14, wherein the applying of the electric field or the magnetic field comprises:

applying the electric field lines or the magnetic field lines in a direction generally perpendicular to the first substrate and the second substrate,; and

arranging the particles in the direction of the electric field lines or the magnetic field lines.

16. The method of claim 15, wherein the particles form a plurality of chains that are each arranged in a direction generally perpendicular to the first substrate and the second substrate.

17. The method of claim 14, wherein the particles are linearly arranged end to end between the first substrate and the second substrate.

18. The method of claim 14, wherein the particles comprise a polarizable organic material.

19. The method of claim 18, wherein the organic material is one selected from the group consisting of polyaniline, polypyrrole, poly(p-phenylene), poly naphthalene quinine radicals, poly acene quinone radicals, poly phenylenediamine, and polythiophene.

20. The method of claim 14, wherein the particles comprise a polarizable inorganic material.

21. The method of claim 20, wherein the inorganic material is one selected from the group consisting of silica gel, silica, zeolite, and a mesoporous material.

22. The method of claim 13, wherein the sealant comprises an insulating material.

23. The method of claim 22, wherein the sealant comprises one selected from the group consisting of silicon, epoxy, and acryl.

24. The method of claim 12, wherein the hardening of the adhesive unit is performed by heating the adhesive unit.

25. The method of claim 12, wherein the hardening of the adhesive unit is performed by applying ultraviolet rays to the adhesive unit.

26. The method of claim 12, wherein the hardening of the adhesive unit is performed when the electric field or the magnetic field is applied to the adhesive unit.

* * * * *

专利名称(译)	有机发光显示装置和制造有机发光显示装置的方法		
公开(公告)号	US20110133170A1	公开(公告)日	2011-06-09
申请号	US12/948402	申请日	2010-11-17
[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CO.，LTD.，		
当前申请(专利权)人(译)	三星DISPLAY CO.，LTD.		
[标]发明人	OH MIN HO CHO YOON HYEONG LEE BYOUNG DUK LEE SO YOUNG LEE SUN YOUNG LEE JONG HYUK		
发明人	OH, MIN-HO CHO, YOON-HYEONG LEE, BYOUNG-DUK LEE, SO-YOUNG LEE, SUN-YOUNG LEE, JONG-HYUK		
IPC分类号	H01L51/50 H01L51/54 H01L51/56		
CPC分类号	H01L51/5246		
优先权	1020090119907 2009-12-04 KR		
其他公开文献	US8586970		
外部链接	Espacenet USPTO		

摘要(译)

提供一种包括第一基板的有机发光显示装置;形成在第一基板上的有机发光单元;第二基板，设置在有机发光单元上;粘合单元，用于将第一基板和第二基板彼此粘合，其中粘合单元包括密封剂和布置在密封剂中的颗粒，以阻止外部杂质的渗透。还提供了制造有机发光显示装置的方法。