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(54) **ORGANIC LIGHT EMITTING DISPLAY AND FABRICATING METHOD THEREOF**

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(57) **ABSTRACT**

A thin organic light emitting device that can be used in thin devices like mobile phones and personal digital assistants. An organic light emitting display (OLED) includes a layer that blocks UV rays so that the diode and the transistor are shielded from UV rays during and after production. In order to prevent breakage during production, two substrates are bonded together and the devices are formed on each of the two substrates, providing a thicker structure that is less apt to break. The substrates are separated after production is complete.

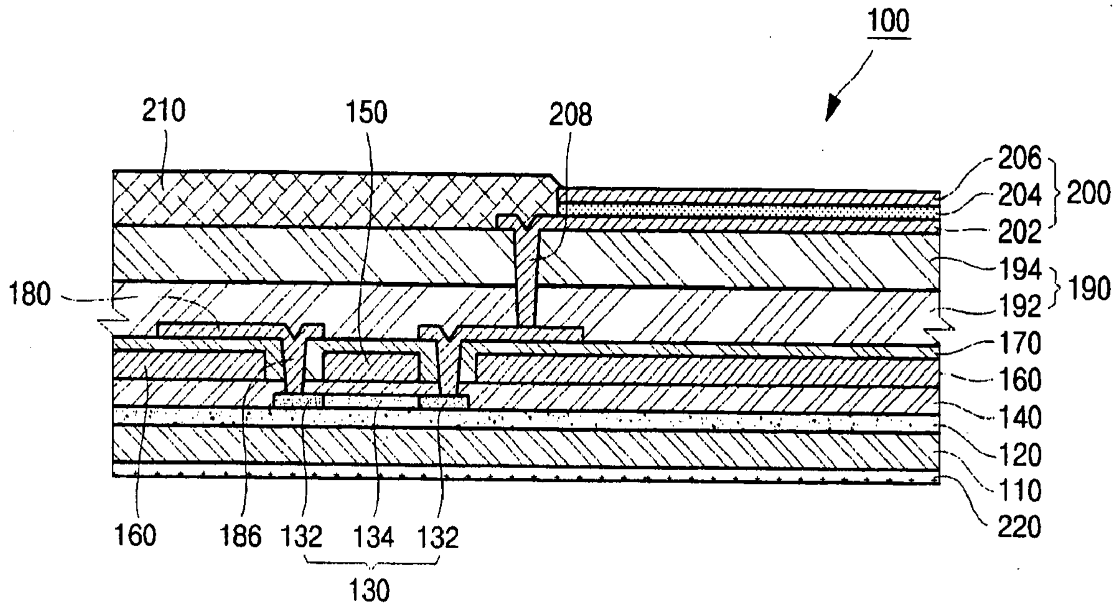


FIG. 1

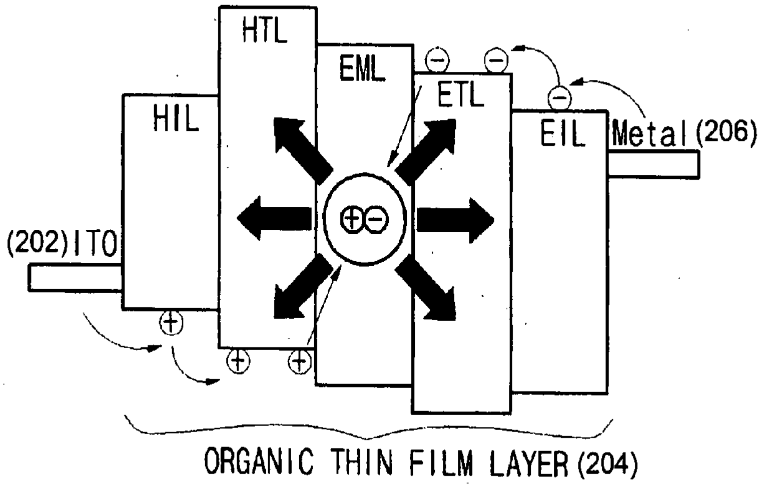

HTL
EML
HIL
ETL
EIL
Metal (206)
(202) ITO
ORGANIC THIN FILM LAYER (204)

FIG. 2

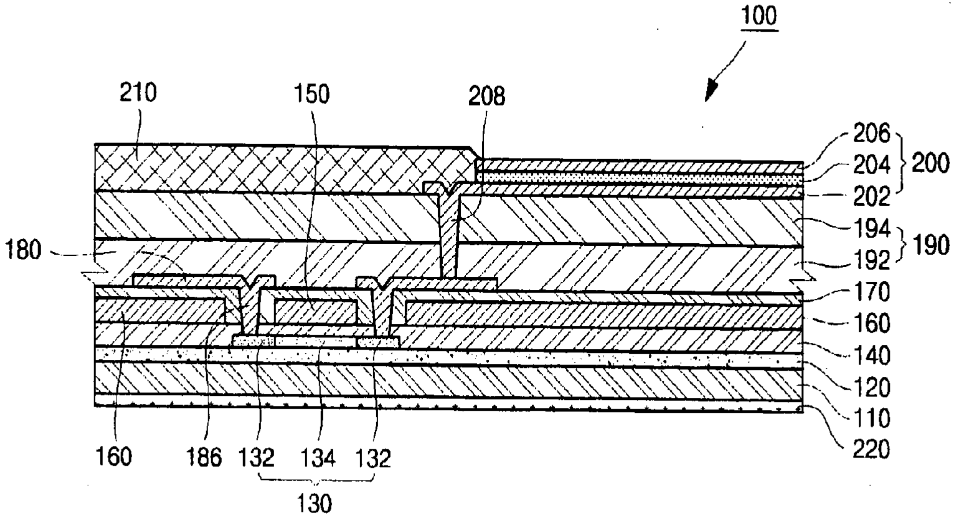

100
210
150
208
206
204
200
202
194
190
192
180
170
160
140
120
110
220
160
186
132
134
132
130

FIG. 3

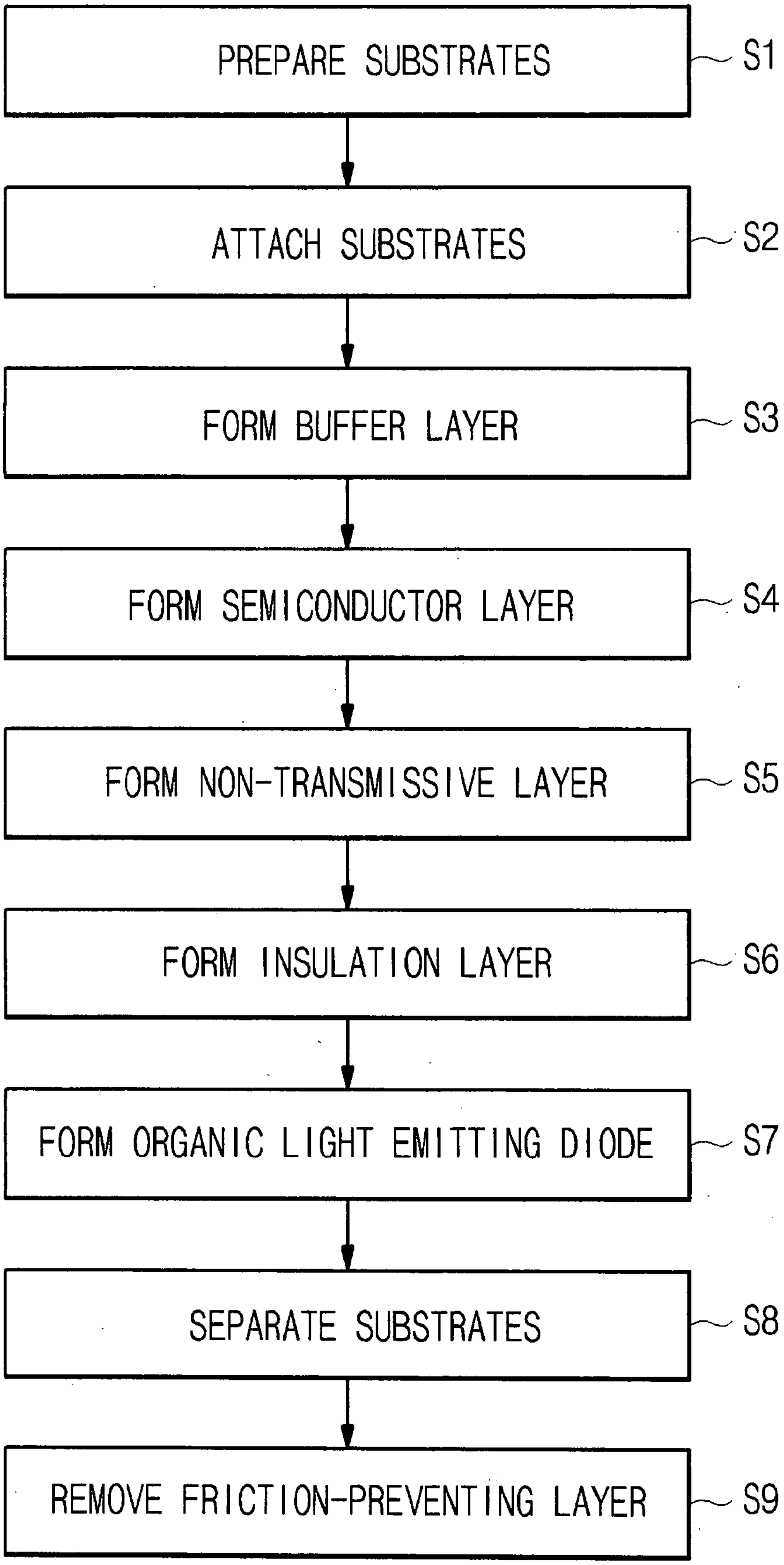

PREPARE SUBSTRATES
S1
ATTACH SUBSTRATES
S2
FORM BUFFER LAYER
S3
FORM SEMICONDUCTOR LAYER
S4
FORM NON-TRANSMISSIVE LAYER
S5
FORM INSULATION LAYER
S6
FORM ORGANIC LIGHT EMITTING DIODE
S7
SEPARATE SUBSTRATES
S8
REMOVE FRICTION-PREVENTING LAYER
S9

FIG. 4a

FIG. 4b

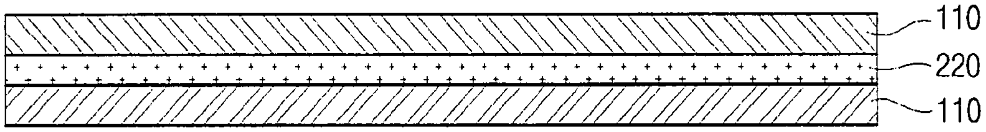


FIG. 4c

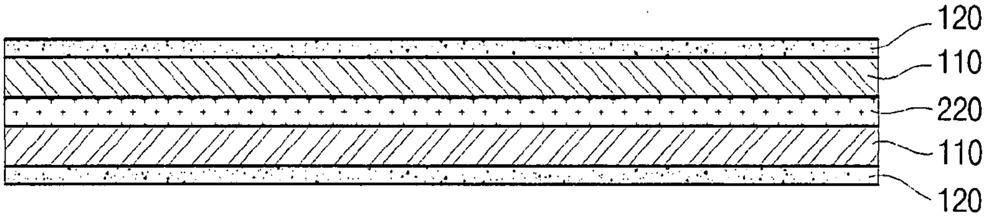


FIG. 4d

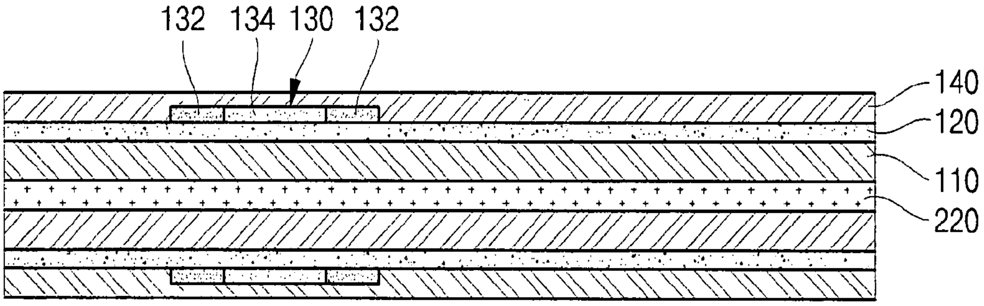


FIG. 4e

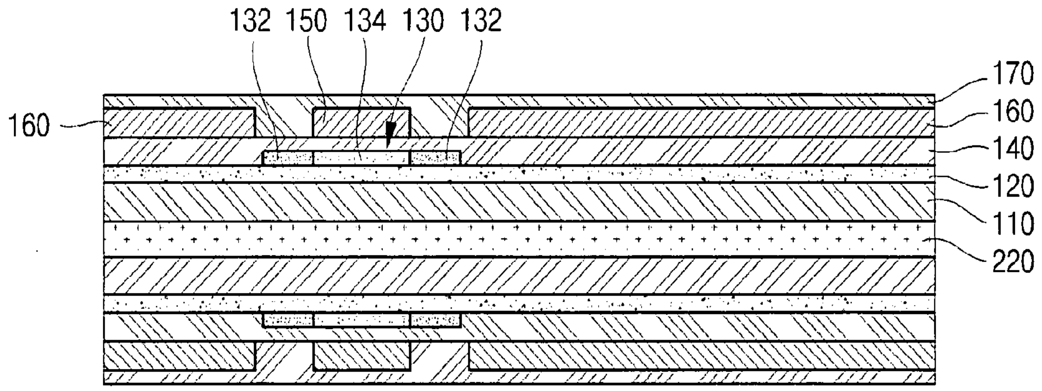

132
150
134
130
132
170
160
160
140
120
110
220

FIG. 4f

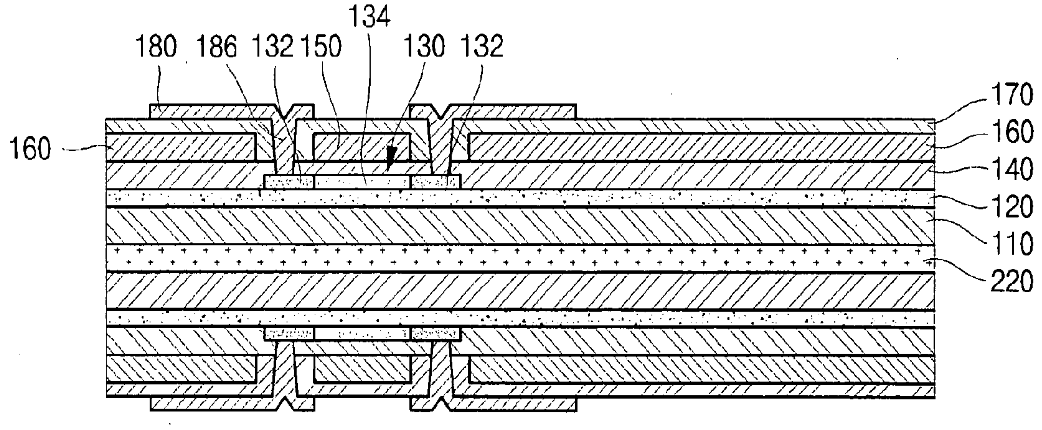

134
180
186
132
150
130
132
170
160
160
140
120
110
220

FIG. 4g

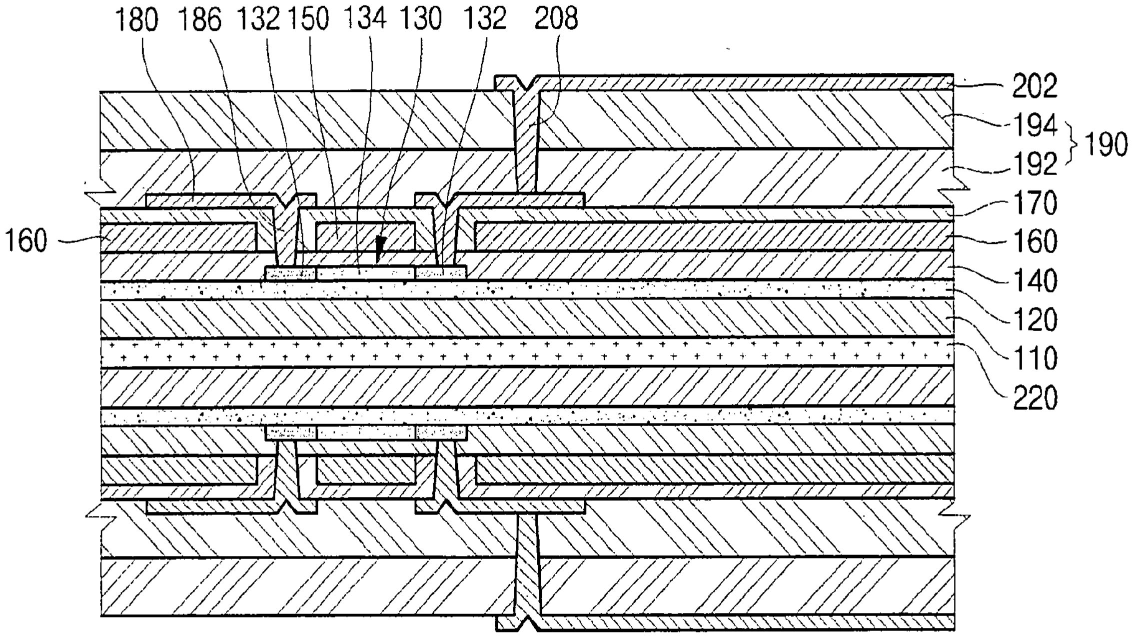

180
186
132
150
134
130
132
208
202
194
190
192
170
160
160
140
120
110
220

FIG. 4h

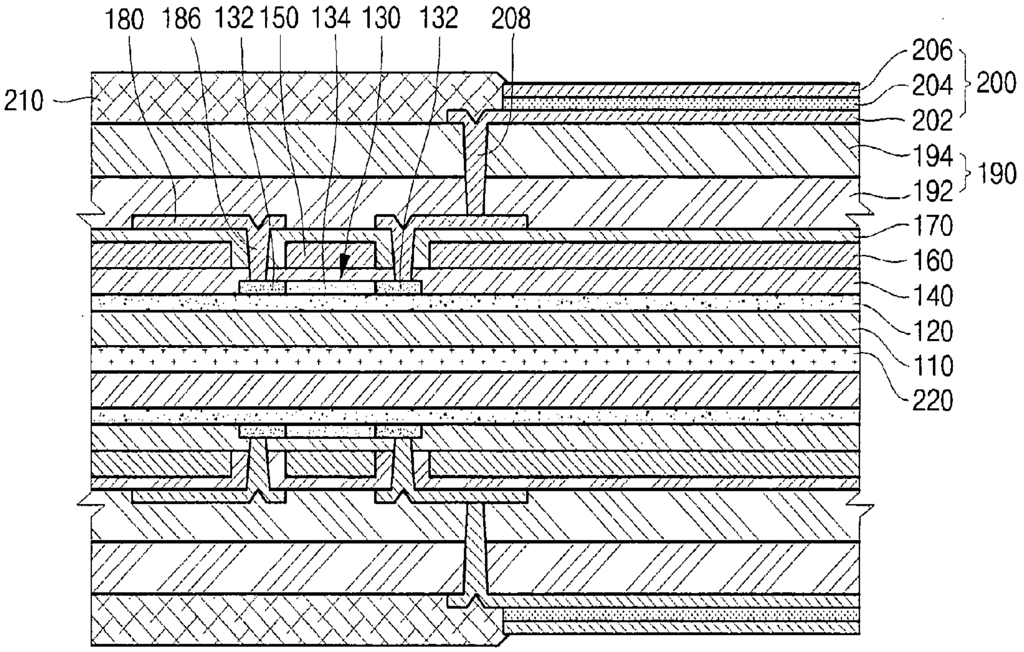

180
186
132
150
134
130
132
208
206
204
200
202
210
194
190
192
170
160
140
120
110
220

FIG. 4i

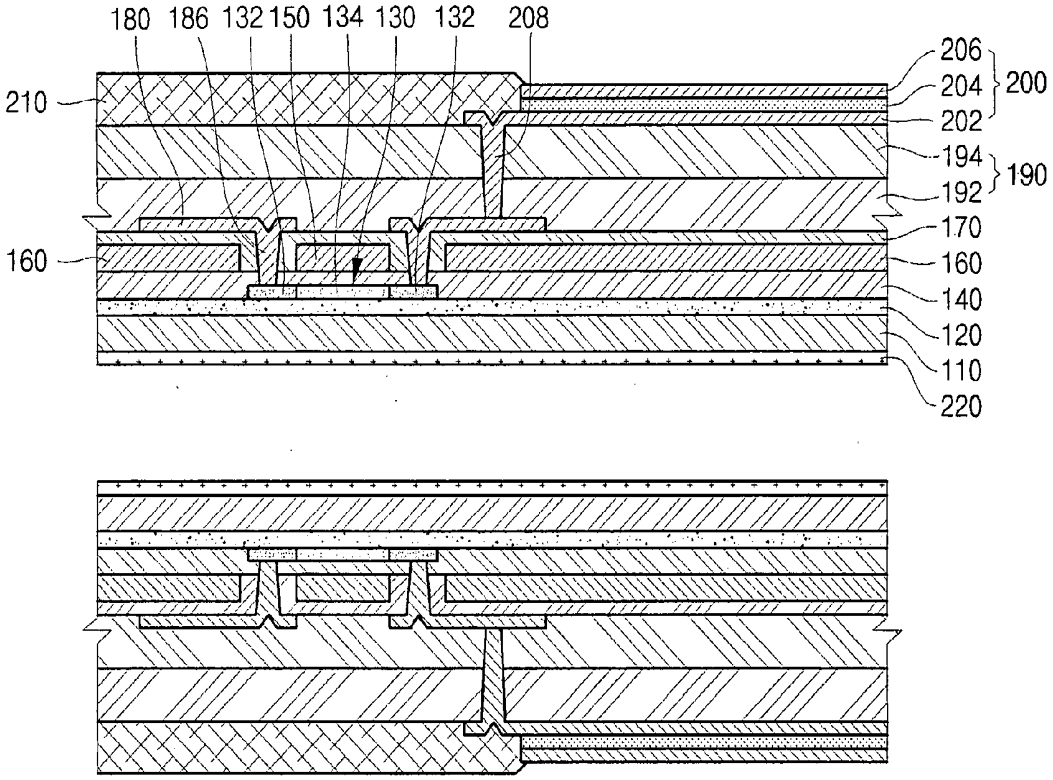
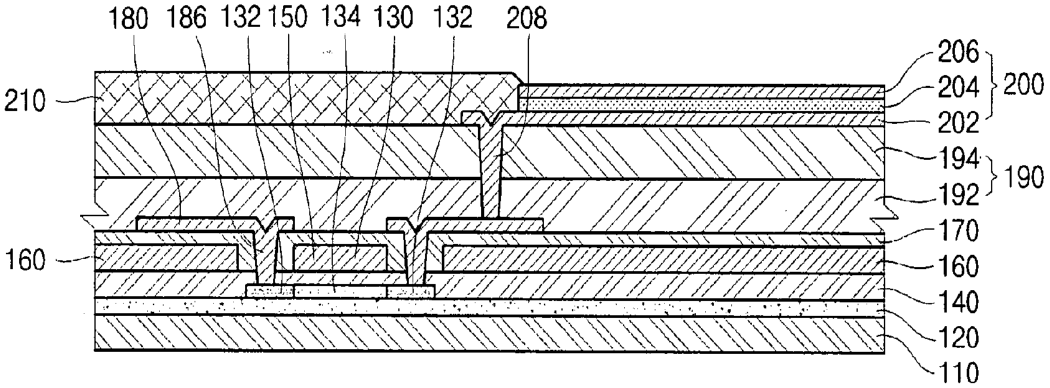

180
186
132
150
134
130
132
208
210
206
204
200
202
194
190
192
170
160
160
140
120
110
220

FIG. 4j


180
186
132
150
134
130
132
208
210
206
204
200
202
194
190
192
170
160
160
140
120
110

ORGANIC LIGHT EMITTING DISPLAY AND FABRICATING METHOD THEREOF

CLAIM OF PRIORITY

[0001] This application makes reference to, incorporates the same herein, and claims all benefits accruing under 35 U.S.C. §119 from an application for ORGANIC LIGHT EMITTING DISPLAY AND FABRICATING METHOD THEREOF earlier filed in the Korean Intellectual Property Office on 10 Nov. 2006 and there duly assigned Serial No. 10-2006-0111299.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a thin organic light emitting display that can be used in thin devices like mobile phones, personal digital assistants etc, and where UV-rays cannot be transmitted to an organic light emitting diode via a substrate during fabrication or after fabrication, and a method of making where the substrate is not bent or damaged during fabrication and where the time of making is reduced.

[0004] 2. Description of the Related Art

[0005] An organic light emitting diode (OLED) drives a current to fluorescent or phosphorescent organic material, where electrons and holes are combined, causing the OLED to emit light. An OLED displays an image by voltage programming or current programming on, for example, a matrix of n rows and m columns.

[0006] A basic OLED includes an anode, an organic thin film layer, and a cathode electrode. As illustrated in FIG. **1**, the organic thin film layer can include an emitting layer (EML) that emits light by forming an excitons upon recombination of electrons and holes, an electron transport layer (ETL) that regulates the velocity of the flow of electrons, and a hole transport layer (HTL) that regulates the velocity of the flow of holes, an electron injection layer (EIL) that improves the injection efficiency of electrons can be formed on the electron transport layer, and a hole-injecting layer (HIL) that improves the injection efficiency of holes can be formed on the hole transport layer.

[0007] An OLED can be used as a moving picture display of a small or a large size because of advantages such as a wide-viewing angle, high response speed, and self-emission. The OLED consumes little power, and because a back light is not necessary, and can be fabricated lightly in a flat-panel display. The OLED can be fabricated at a low temperature, and because of the simple fabricating process, it can be fabricated at a low price. Recently, along with rapid development of organic thin-film material-related technologies, the OLED is being considered as a growing technology in the flat panel display market.

[0008] However, since electronic applications such as mobile phones, a personal digital assistants, a lap-top computers, computer monitors, and televisions are being made slim, there is a need to fabricate OLED to a thickness of less than 1 mm. However, because a protective film technology that can serve as a substitute to encapsulation technology has not been fully developed, it is difficult to make the thickness of an OLED less than 1 mm.

[0009] In order to fabricate an OLED to a thickness of less than 1 mm, JP 2005-340182, JP 2005-222930, and JP 2005-22789 describe a method of fabricating a slim OLED by forming each device layer (i.e., a semiconductor layer and an organic light emitting diode) on two glass substrates, attaching glass substrates in such a manner that each device layer faces each other, and then removing the substrate that does not include the device layer by etching or grinding. However, according to this method, the processes of attachment and etching or grinding consumes a lot of time. According to this method, since almost completed glass substrates are attached, glass substrates, semiconductor layers and OLED devices are often damaged or broken, causing production yield to be low, resulting in high production costs. In an alternative approach, a device layer can be formed on the substrate by fabricating the glass substrate to a thickness of less than 1 mm, however such thin glass substrates can easily cause the glass substrate to bend or be damaged when it comes into contact with the fabricating apparatuses. Therefore, what is needed is an improved design for an OLED and an improved method of making the same which results in a thin OLED where production costs are better contained by improving production yield.

SUMMARY OF THE INVENTION

[0010] It is therefore an object of the present invention to provide an improved design for a thin OLED that can be used in small devices like mobile phones, personal digital assistants etc.

[0011] It is also an object of the present invention to provide a method of making the same where the production costs and production time are reduced.

[0012] It is also an object of the present invention is to provide a design and a method of making an OLED where the organic light emitting diode is protected from being exposed to UV rays during and after fabrication of the OLED.

[0013] It is further an object of the present invention to provide a method of making a thin OLED where the occurrence of bending and damage to the substrate during fabrication is reduced.

[0014] It is still an object of the present invention to reduce the time it takes to fabricate the thin OLED, resulting in higher productivity and reduced costs.

[0015] These and other objects can be achieved by an organic light emitting display (OLED) that includes a substrate, an organic light emitting diode, an insulating layer, a gate insulating layer and a semiconductor layer arranged on the substrate, the insulating layer being arranged between the organic light emitting diode and the gate insulating layer, the gate insulating layer being arranged between the insulating layer and the semiconductor layer and a non-transmissive layer arranged on the gate insulating layer, the non-transmissive layer being adapted to block UV-rays. The OLED may also include a buffer layer arranged on the substrate, a gate electrode arranged on the gate insulating layer, an inter-layer dielectric layer arranged on the gate electrode and source/drain electrodes arranged on the inter-layer dielectric layer, the insulating layer can be arranged between the source/drain electrode and the organic light emitting diode.

[0016] The non-transmissive layer can be arranged at an outer side of the semiconductor layer. The semiconductor layer and the source/drain electrodes can be coupled together by a conductive contact that penetrates through the gate insulating layer and through the inter-layer dielectric layer, and the non-transmissive layer being can be arranged at the outer side of the conductive contact. The non-transmissive layer can be arranged beneath the source/drain electrodes. The non-transmissive layer being arranged beneath the organic light emitting diode. The non-transmissive layer being arranged at portions that do not correspond to the organic light emitting diode. The non-transmissive layer being made out of a same material as that of the gate electrode. The non-transmissive layer can be of a same thickness as that of the gate electrode. The non-transmissive layer being made out of molybdenum (Mo), molybdenum tungsten (MoW), titanium (Ti), copper (Cu), aluminum (Al), aluminic neodymium (AlNd), chrome (Cr), molybdenum alloy, copper alloy, aluminum alloy, or doped poly silicon. The non-transmissive layer being an UV-light protective agent. The non-transmissive layer being made out of an UV-ray non-transmissive metal, a transmissive UV-ray protective agent metal or a non-transmissive UV-ray protective agent metal. The non-transmissive layer being made out of chrome (Cr), chrome oxide (Cr_2O_3), aluminum (Al), gold (Au), silver (Ag), magnesium oxide (MgO) or silver alloy (ATD). The non-transmissive layer being of a thickness between 500 Å and 3000 Å. The substrate can be of a thickness between 0.05 mm and 1 mm. The substrate can be made out of glass, plastic, polymer or steel. The OLED can also include a friction-preventing layer arranged beneath the substrate. The friction-preventing layer can be between 10 and 100 microns thick. The friction-preventing layer can be an organic material or an inorganic material.

[0017] According to another aspect of the present invention, there is provided a method of making an OLED, including preparing two substrates, attaching together the two substrates, forming a buffer layer on outside sides of the two attached substrates, forming a semiconductor layer on each buffer layer, forming a non-transmissive layer on outside sides of the semiconductor layers, forming an insulation layer on each semiconductor layer and on each non-transmissive layer, forming an organic light emitting diode each insulation layer and separating the two attached substrates.

[0018] The method can also include forming a gate insulating layer on the semiconductor layer; and forming a gate electrode on the gate insulating layer between the forming of the semiconductor layer and the forming of the non-transmissive layer. The method can instead include, after the forming of the semiconductor layer, forming a gate insulating layer on the semiconductor layer and forming a gate electrode on the gate insulating layer, wherein the forming of the non-transmissive layer occurs simultaneously with the forming of the gate electrode. The forming of the non-transmissive layer can be achieved by the forming of the non-transmissive layer on the gate insulating layer. The non-transmissive layer can be made out of a same material as that of the gate electrode. The non-transmissive layer can be arranged beneath the organic light emitting diode. The non-transmissive layer can be made of a material such as molybdenum (Mo), molybdenum tungsten (MoW), titanium (Ti), copper (Cu), aluminum (Al), aluminic neodymium (AlNd), chrome (Cr), molybdenum alloy, copper alloy, aluminum alloy or doped poly silicon. The non-transmissive layer can be an ultraviolet protective agent. The non-transmissive layer can be made out of a metal that UV-rays cannot penetrate, a permeable UV-ray protective agent, or a non-transmissive UV-ray protective agent. The non-transmissive layer can be made out of chrome (Cr), chrome oxide (Cr_2O_3), aluminum (Al), gold (Au), silver (Ag), magnesium oxide (MgO) or silver alloy (ATD). The attaching of the substrates can include forming a friction-preventing layer between the substrates. The method can also include removing the friction-preventing layer after the separating the substrates.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] 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:

[0020] FIG. **1** is a view of an organic thin film layer;

[0021] FIG. **2** is a sectional view of an organic light emitting display according to the present invention;

[0022] FIG. **3** is a flowchart illustrating a method of fabricating the organic light emitting display of FIG. **2**; and

[0023] FIGS. **4**A to **4**J are sectional views illustrating the order of the fabrication process of the organic light emitting display according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0024] Turning now to the figures, FIG. **2** is a sectional view illustrating an organic light emitting display **100** according to the present invention. As illustrated in FIG. **2**, the organic light emitting display (OLED) **100** includes a substrate **110**, a buffer layer **120** formed on the substrate **110**, a semiconductor layer **130** formed on the buffer layer **120**, a gate insulating layer **140** formed on the semiconductor layer **130**, a gate electrode **150** formed on the gate insulating layer **140**, a non-transmissive layer **160** formed on the gate insulating layer **140**, an inter-layer dielectric layer **170** formed on the gate electrode **150** and on the non-transmissive layer **160**, source/drain electrodes **180** formed on the inter-layer dielectric layer **170**, an insulation layer **190** formed on the source/drain electrode **180**, the insulation layer being beneath the organic light emitting diode **200**, the organic light emitting diode **200** formed on the insulation layer **190**, a pixel-defining film **210** formed on the insulation layer **190**, and a friction-preventing layer **220** formed beneath the substrate **110**.

[0025] Both sides of the substrate **110** are flat, and the thickness of the substrate **110** is between 0.05 and 1 mm. When the thickness of the substrate **110** is less than 0.05 mm, the substrate can easily be damaged during washing, etching, heat-treatment processes, and application of external force. When the thickness of the substrate **110** is more than 1 mm, the resultant OLED becomes too thick to be useful in many modern devices. The substrate **110** can be made out of one of glass, plastic, polymer, steel and the equivalent, however the present invention is not limited to just these materials.

[0026] The buffer layer **120** can be formed on the upper side of the substrate **110**. The buffer layer **120** prevents moisture (H_2O), hydrogen (H_2), and oxygen (O_2) from penetrating the substrate **110** and reaching the semiconductor layer **130** or the organic light emitting diode **200**. The buffer layer **120** can be made out of a material such as silicon oxide (SiO_2), silicon nitride (Si_3N_4), an inorganic material or the equivalent, however the present invention is not limited to just these materials. The buffer layer **120** can also be omitted depending on the situation.

[0027] The semiconductor layer **130** can be formed on the upper side of the buffer layer **120**. The semiconductor layer **130** includes source/drain areas **132** located at both sides thereat and facing away from each other, and a channel area **134** located between the source/drain areas **132**. The semiconductor layer **130** can be a thin film transistor. The thin film transistor can be one of an amorphous silicon (Si) thin film transistor, a poly silicon (Si) thin film transistor, an organic thin film transistor, micro silicon (Si), which has a grain size between that of amorphous silicon and poly silicon or an equivalent, however the types of the thin film transistors of the present invention are not limited to just these examples. When the thin film transistor is a poly silicon thin film transistor, the poly silicon thin film transistor can be made by crystallizing the poly silicon using a laser at a low temperature, crystallizing the poly silicon using metal or crystallizing the poly silicon using high pressure, however the present invention is not limited to just these crystallization methods. The method of crystallizing the poly silicon using the laser can be achieved via Excimer Laser Annealing (ELA), Sequential Lateral Solidification (SLS) or Thin Beam Direction Crystallization (TDX), however the present invention is not limited to just these methods. The method of crystallizing the poly silicon using metal can be achieved by Solid Phase Crystallization (SPC), Metal Induced Crystallization (MIC), Metal Induced Lateral Crystallization (MILC), and Super Grained Silicon (SGS), however the present invention is not limited to just these methods. The thin film transistor can be either a PMOS, an NMOS, or an equivalent, however the conductive type of the thin film transistor is not limited to just these types.

[0028] The gate insulating layer **140** can be formed on the upper side of the semiconductor layer **130** and on exposed portions of the buffer layer **120**. The gate insulating layer **140** can be made out of a material such as silicon dioxide (SiO_2), silicon nitride (Si_3N_4), an inorganic material or an equivalent, however the present invention is not limited to just these materials.

[0029] The gate electrode **150** can be formed on the upper side of the gate insulating layer **140**. More specifically, the gate electrode **150** can be formed on the gate insulating layer **140** at a location corresponding to the channel area **134** of the semiconductor layer **130**. The gate electrode **150** serves to apply an electric field to the channel area **134**, thereby forming a hole or an electron channel in the channel area **134**. The gate electrode **150** can be made out of a metal such as Mo, MoW, Ti, Cu, Al, AlNd, Cr, Mo alloy, Cu alloy, Al alloy or others, however the present invention is not limited to just these materials.

[0030] The non-transmissive layer **160** can be formed on the upper side of the gate insulating layer **140**. The non-transmissive layer **160** can instead be formed underneath the semiconductor layer **130** and the conductive contact **186** which will be described later. The non-transmissive layer **160** is situated underneath the organic light emitting diode **200**. The non-transmissive layer **160** can be formed not only underneath the organic light emitting diode **200**, but also extend into other areas of the OLED **100**. The non-transmissive layer **160** is also situated so that it overlaps a portion of the source/drain electrodes **180**.

[0031] The non-transmissive layer **160** serves to prevent UV-rays from transmitting through the OLED and damaging sensitive layers within the OLED during fabrication of the organic light emitting diode **200**. The non-transmissive layer **160** also prevents external UV-rays from damaging the organic light emitting diode **200** after the substrates **110** are separated from each other.

[0032] The non-transmissive layer **160** can be made out of the same material as that of the gate electrode **150**. The non-transmissive layer **160** can be made out of Mo, MoW, Ti, Cu, Al, AlNd, Cr, Mo alloy, Cu alloy or an Al alloy, however the present invention is not limited to just these materials. The thickness of the non-transmissive layer **160** can be the same as the thickness of the gate electrode **150**.

[0033] The non-transmissive layer **160** can be made out of a UV-ray protective agent or its equivalent. The non-transmissive layer **160** can be made out of a metal where UV-rays can not penetrate, a transparent UV-ray protective agent, an opaque UV-ray protective agent or the equivalent. When the non-transmissive layer **160** is metal, it can be made out of a material such as chrome (Cr), chrome oxide (Cr_2O_3), aluminum (Al), gold (Au), silver (Ag), magnesium oxide (MgO) or silver alloy (ATD), but the present invention is not limited to just these materials. The non-transmissive layer **160** can be between 500 and 3000 Å thick. When the thickness of the non-transmissive layer **160** is less than 500 Å, because the isolation rate of UV-rays are low, before or after fabrication, the semiconductor layer **130** or the organic light emitting diode **200** can be exposed. When the thickness of the non-transmissive layer **160** is more than 3000 Å, despite sufficient isolation efficiency, it can be excessively thick.

[0034] The inter-layer dielectric layer **170** can be formed on the upper side of the gate electrode **150** and the non-transmissive layer **160**. The inter-layer dielectric layer **170** can be made out of one of glass, plastic, polymer or an equivalent, but the present invention is not limited to just these materials.

[0035] The source/drain electrodes **180** can be formed on the upper side of the inter-layer dielectric layer **170**. The semiconductor layer **130** and each of the source/drain electrodes **180** are electrically connected by conductive contacts **186** that penetrate through the inter-layer dielectric layer **170**. Further, the conductive contacts **186** can be formed in such a manner that the conductive contacts **186** do not contact the non-transmissive layer **160**. Further, the source/drain electrodes **180** can be made out of a metal similar to that used in the gate electrode **150**, but the present invention is not limited to just these materials. Further, such a semiconductor layer **130** (i.e., a thin film transistor) can be defined as a coplanar structure. The semiconductor layer disclosed in the present invention is not limited to the coplanar structure, but at least one of an inverted coplanar structure, a staggered structure, an inverted staggered structure, or an equivalent structure can instead used. The present invention is not limited to just these structures.

[0036] The insulation layer **190** can be formed on the upper side of the source/drain electrodes **180** and the interlayer dielectric layer **170**. The insulation layer **190** can include a protective film **192**, and a flat film **194** formed on the upper side of the protective film **192**. The protective film **192** covers the source/drain electrodes **180** and the inter-layer dielectric layer **170**, and serves to protect the source/drain electrodes **180**. The protective film **192** can be made out of an inorganic film or an equivalent, but the present invention is not limited to just these materials. Moreover, the flat film **194** serves to produce a flat surface for the whole device, and can be made out of a material such as benzo cyclo butane (BCB), acryl, or an equivalent, but the present invention is not limited to just these materials.

[0037] The organic light emitting diode **200** can be formed on the insulation layer **190**, that is on the upper side of the flat film **194**. Such an organic light emitting diode **200** includes an anode **202**, an organic light-emitting thin film **204** formed on the upper side of the anode **202**, and a cathode **206** formed on the upper side of the organic light-emitting thin film **204**. The anode **202** made out of a material such as indium tin oxide (ITO), ITO/Ag, ITO/Ag/ITO (IZO: indium zinc oxide), but the present invention is not limited to just these materials. ITO is a transparent conductive film having a small hole injection wall on the organic light-emitting thin film **204** because of uniformity of work functions, and the Ag is a film that reflects light from the organic light-emitting thin film **204** to the upper side of the display. Further, as illustrated in FIG. **1**, the organic light-emitting film **204** can include an emitting layer (EML) that emits light by forming an exciton, an electron transport layer (ETL) that appropriately regulates the speed of electrons, and a hole transport layer (HTL) that appropriately regulates the speed of holes. Further, an electron injection layer (EIL) that improves the electron-injecting efficiency can be formed on the electron transport layer, a hole-injecting layer (HIL) that improves the hole-injecting efficiency can be formed on the hole transport layer. Moreover, the cathode **206** can be made out of a material such as Al, MgAg alloy, MgCa alloy or an equivalent, but the present invention is not limited to just these materials. However, in case the front light-emitting type OLED **100**, the Al needs to be very thin. When the Al is made thin, the resistance becomes high and the electron-injecting wall becomes large, which are disadvantageous. The electron-injecting wall of the MgAg alloy is small compared with that of Al, and the electron-injecting wall of the MgCa alloy is lower than that of the wall of the MgAg alloy. However, such a MgAg alloy and MgCa alloy are sensitive to surrounding environments, and can become oxidized, thus forming an insulating layer. Hence, an isolation from the outside needs to be present. Moreover, the anode **202** and the source/drain electrodes **180** of the organic light emitting diode **200** can be electrically connected to each other by an electrically-conductive via **208** penetrating the insulation layer **190**. Further, the present invention has been described for a front light-emitting type device that emits light towards the upper side of the substrate **110**, but the present invention is not limited to this as the present invention can also apply to a backside light-emitting type device that emits light towards the lower direction of the substrate **110**, or the present invention can instead apply to a device that emits light to both-sides at the same time.

[0038] The pixel-defining film **210** can be formed on the upper side of the insulation layer **190**. Such a pixel-defining film **210** makes the light-emitting boundary area between pixels clear by making the boundary between the red organic light emitting diode, the green organic light emitting diode, and the blue organic light emitting diode clear. Further, such a pixel-defining film **210** can be made out of a material such as polyimide or an equivalent, but the present invention is not limited to just these materials.

[0039] Further, a friction-preventing layer **220** can be formed beneath the substrate **110**. Such a friction-preventing layer **220** attaches two substrates **110** together, so that both substrates **110** do not contact each other during forming the semiconductor layer **130** and the organic light emitting diode **200**. Further, such a friction-preventing layer **220** secures that there will be sufficient rigidity by making the attached substrates thick so that the resultant structure will not be bent or damaged during transport or other processes. Such a friction-preventing layer **220** can be made out of an organic material, an inorganic material, or an equivalent, but the present invention is not limited to just these materials. Further, it is preferable for the friction-preventing layer **220** to be formed to have a thickness between 10 and 100 μm. When the thickness of the friction-preventing layer **220** is less than 10 μm, the substrates can contact each other during the fabrication process. When the thickness of the friction-preventing layer **220** is more than 100 μm, the substrates **110** can become excessively thick.

[0040] Referring now to FIG. **3**, FIG. **3** is a flowchart describing a method of fabricating the organic light emitting display device (OLED) **100** of FIG. **2**. As illustrated in FIG. **3**, the method of fabricating the OLED **100** can include preparing substrates S**1**, attaching substrates S**2**, forming a buffer layer S**3**, forming a semiconductor layer S**4**, forming a non-transmissive layer S**5**, forming an insulation layerS**6**, forming an organic light emitting diode S**7**, separating the substrates S**8**, and removing a friction-preventing layer S**9**.

[0041] Turning now to FIGS. **4**A to **4**J, FIGS. **4**A to **4**J are sectional views illustrating the fabrication process of the organic light emitting display (OLED) **100** according to the present invention. Referring to FIGS. **3**, and **4**A to **4**J, the method of fabricating an OLED is described in order.

[0042] First, in step S**1** of preparing the substrates **110**, substrates **110** with uniform thickness and whose upper lower sides are flat are provided. The substrate **110** can be one of glass, plastic, polymer, steel, and the equivalent, but the present invention is not limited to just these materials. Further, it is preferable that the thickness of the substrates **110** be between 0.05 and 1 mm. When the thickness of each substrate **110** is less than 0.05 mm, the substrates can be easily damaged during washing, etching or heat-treatment processes, hard to handle, and easy to be destroyed by external force. Further, when the thickness of the substrates **110** is more than 1 mm, it is difficult to achieve a thickness for the overall device that can be used in today's slim devices.

[0043] As illustrated in FIG. **4**B, in step S**2** of attaching the substrates **110** together, the substrates are mutually attached together. The purpose for attaching the two substrates together for fabrication is **10** so that two display devices can be formed together thereby increasing throughput and reducing production time and **2**) so that a thicker structure is handled during fabrication so that it is less apt to break or be damaged during fabrication, thereby improving production yield. Here, the friction-preventing layer **220** can be interposed between the two substrates **110** in such a manner that the two substrates **110** do not directly contact each other, while providing a certain rigidity during the fabrication process. The friction-preventing layer **220** can be made by attaching or coating an organic material, an inorganic material, or an equivalent, however the present invention is not limited to just these materials. Here, if the friction-preventing layer **220** is removed after the OLED is completed, it is preferred that the friction-preventing layer **220** is made out of a material that is easily removable. For example, photo resist, which is an organic material, can be used, but the present invention is not limited to this material. Moreover, adhesives (not shown) can be also interposed in such a manner that two substrates **110** are not separated from each other during the fabrication processes. Such adhesives can be an epoxy adhesive, a UV light-hardening adhesive, or an equivalent, but the present invention is not limited to just these adhesives. Further, the friction-preventing layer **220** can be formed on each substrate **110** in advance prior to attachment, however after the two substrates **110** are interposed for attachment, the liquid friction-preventing layer **220** can be injected into the crevice formed between the two substrates **110** for formation because the injection is easy because of capillary forces. Here, it is preferable for the friction-preventing layer **220** to be hardened by heat-treating the substrates **110** at predetermined temperature after the formation of such a liquid friction-preventing layer **220**.

[0044] As illustrated in FIG. **4**C, in step S**3** of forming the buffer layer **120**, a predetermined thickness of buffer layer **120** is formed on the surface of each substrate **110** on opposite sides of the two substrate structure away from a side where the friction-preventing layer **220** is formed. The buffer layer **120** can be made out of a silicon oxide film, a silicon nitride film, an inorganic film, or an equivalent. The buffer layer **120** is included so that moisture, hydrogen, or oxygen can not be transmitted to the semiconductor layer **130** or the organic light emitting diode **200**. The buffer layer **120** also makes it easier to form the semiconductor layer **130** on the surface. The buffer layer **120** can be first formed on the substrate **110** of one side, and then be formed on another substrate **110** in order, or can be formed on both substrates **110** at the same time.

[0045] As illustrated in FIG. **4**D, in step S**4** of forming the semiconductor layer **130**, the semiconductor layer **130** is formed on the surface of the buffer layer **120**, and the gate insulating layer **140** is then formed on the resultant structure. The semiconductor layer **130** includes the source/drain areas **132** on both sides facing away from each other, and includes the channel area **134** between the source/drain areas **132**. For example, the semiconductor layer **130** can be a thin film transistor. Such a thin film transistor can be an amorphous silicon thin film transistor, a poly silicon thin film transistor, an organic thin film transistor, a micro silicon thin film transistor, or an equivalent, but the present invention is not limited to just these transistors.

[0046] Further, when the thin film transistor is a poly silicon thin film transistor produced after the amorphous silicon is formed on the buffer layer **120**, crystallization can be performed using one of a laser at low temperature, a metal, high pressure, or an equivalent, however, the present invention is not limited to just these methods.

[0047] Here, the amorphous silicon can be formed using PECVD, LPCVD, sputtering, or an equivalent, but the present invention is not limited to just these methods. Moreover, after crystallizing amorphous silicon, a desired number of semiconductor layers **130** are formed at the desired locations via photo resist application, illumination, developing, etching, and photo resist peeling processes.

[0048] Further, some examples of methods of crystallizing amorphous silicon into poly silicon are excimer laser annealing (ELA), sequential lateral solidification (SLS), and thin beam direction crystallization (TDX), but the present invention is not limited to just these methods. Some examples of methods of crystallizing using metal are solid phases crystallization (SPC), metal induced crystallization (MIC), metal induced lateral crystallization (MILC), and super grained silicon (SGS), but the present invention is not limited to just these methods. Further, the thin film transistor can be one of PMOS, NMOS, or an equivalent, but the present invention is not limited to just these structures.

[0049] A predetermined thickness of the gate insulating layer **140** is formed on the surface of the semiconductor layer **130** using one of PECVD, LPCVD, sputtering, or an equivalent method. Here, the gate insulating layer **140** can also be formed on the buffer layer **120**. Further, the gate insulating layer **140** can be made out of a silicon oxide film, a silicon nitride film, an inorganic film, or an equivalent, but the present invention is not limited to just these materials.

[0050] As illustrated in FIG. **4**E, the gate electrode **150** can be formed on the upper side of the gate insulating layer **140** by one of PECVD, LPCVD, sputtering, or an equivalent. Here, a desired number of gate electrodes **150** are formed at the desired position through photo resist application, illuminating, developing, etching, and photo resist peeling processes after the deposition process. That is, the gate electrode **150** can be formed on the gate insulating layer **140** at a location that corresponds to the channel area **134** of the semiconductor layer **130**. Such a gate electrode **150** produces an electric field in the channel area **134**, whereby the hole or electron channel is formed in the channel area **134**. Further, the gate electrode **150** can be made out of a metal such as Mo, MoW, Ti, Cu, Al, AlNd, Cr, Mo alloy, Cu alloy, or Al alloy, doped poly silicon, or an equivalent, but the present invention is not limited to just these materials.

[0051] Further, as illustrated in FIG. **4**E, in step S**5** of forming the non-transmissive layer **160**, the non-transmissive layer **160** can be formed simultaneously with the forming of the gate electrode **150**. Here, the non-transmissive layer **160** is formed at a location that is at a certain distance from the semiconductor layer **130** and the gate electrode **150** in such a manner that the non-transmissive layer **160** does not contact the conductive contact **186** that electrically connects the source/drain electrodes **180** to the source/drain areas **132**. Further, the non-transmissive layer **160** is widely formed on an area beneath the organic light emitting diode **200** so that UV-rays do not reach the organic light emitting diode **200** during formation. Further, the non-transmissive layer **160** can be formed of the same material and to the same thickness as that of the gate electrode **150**. That is, the non-transmissive layer **160** can be formed using at least one of Mo, MoW, Ti, Cu, Al, AlNd, Cr, Mo alloy, Cu alloy, Al alloy, doped poly silicon, and the equivalent, but the present invention is not limited to just these materials. Here, the non-transmissive layer **160** is used in such a manner that the outside UV-rays do not penetrate the organic light emitting diode **200**, but instead are reflected after the substrates **110** have been separated.

[0052] Further, the non-transmissive layer **160** can be made out of a UV-ray protective agent or an equivalent. That is, the non-transmissive layer **160** can be made out of one of a metal that UV-rays cannot penetrate, a transparent UV-ray protective agent, an opaque UV-ray protective agent or an equivalent. Further, in case that the non-transmissive layer **160** is metal, the non-transmissive layer **160** can be chrome (Cr), chrome oxide (Cr_2O_3), aluminum (Al), gold (Au), silver (Ag), magnesium oxide (MgO), silver alloy (ATD) or an equivalent, however the present invention is not limited to just these materials. Further, it is preferable for such a non-transmissive layer **160** be between 500 and 3000 Å thick. When the thickness of the non-transmissive layer **160** is less than 500 Å, because the UV-ray isolation rate is low, both before or after the fabricating processes, the organic light emitting diode **200** can be exposed to some UV rays. When the thickness of the non-transmissive layer **160** is more than 3000 Å, the non-transmissive layer **160** can be excessively thick despite the sufficient UV-ray isolation rate.

[0053] The non-transmissive layer **160** can be made by plasma enhanced chemical vapor deposition (PECVD), low pressure chemical vapor deposition (LPCVD), sputtering, coating or an equivalent, however the present invention is not limited to just these methods. Here, such a non-transmissive layer **160** can be formed first on the substrate of one side, then on the other substrate in order, or can instead be formed on both substrates at the same time.

[0054] As illustrated in FIG. **4**E, an inter-layer dielectric layer **170** can be formed on the upper side of the gate electrode **150** and the non-transmissive layer **160**. The inter-layer dielectric layer **170** can be made out of one of polymer, plastic, glass, or an equivalent, but the present invention is not limited to just these materials. Here, the area corresponding to the source/drain areas **132** are used in such a manner that the source/drain areas **132** are exposed to the outside through etching. This exposed portion becomes a contact hole, and a conductive contact **186** is formed in this contact hole.

[0055] Further, as illustrated in FIG. **4**F, the source/drain electrodes **180** are produced by either PECVD, LPCVD, sputtering, or an equivalent on the upper side of the inter-layer dielectric layer **170**. Here, a desired number of source/drain electrodes **180** are formed at the desired position through photo resist application, illuminating, developing, etching, and photo resistpeelingprocesses after the deposition. Here, a certain area of the source/drain electrodes **180** can overlap the non-transmissive layer **160**. An electrically-conductive contact **186** that penetrates the inter-layer dielectric layer **170** is formed between the source/drain electrodes **180** and the source/drain areas **132** of the semiconductor layer **130**. Here, the conductive contact **186** is charged in advance. Moreover, the conductive contact **186** is designed not to contact the non-transmissive layer **160**.

[0056] The semiconductor layer **130** and the source/drain electrodes **180** are electrically connected by the conductive contacts **186**. Such a conductive contacts **186** can be formed using materials similar to those used to form the gate electrode **150** and the source/drain electrodes **180**, however the present invention is in no way so limited. Further, the source/drain electrodes **180** can be made out of the same metal materials used to form the gate electrode **150**, however the present invention is in no way so limited. The semiconductor layer **130** used to form the thin film transistor is defined by a general coplanar structure. However, the semiconductor layer **130** according to the present invention can instead be of an inverted coplanar structure, a staggered structure, an inverted staggered structure, or an equivalent, but the present invention is not limited to just these structures.

[0057] The semiconductor layer **130**, the gate insulating layer **140**, the gate electrode **150**, the non-transmissive layer **160**, and the inter-layer dielectric layer **170** are formed on one of the substrates **110** and then on the other of the two substrates **110**. That is, the semiconductor layer **130**, the gate insulating layer **140**, the gate electrode **150**, the non-transmissive layer **160**, and the inter-layer dielectric layer **170** are completed on one of the two substrates **110**, and the semiconductor layer **130**, the gate insulating layer **140**, the gate electrode **150**, the non-transmissive layer **160**, and the inter-layer dielectric layer **170** are then completed on the other of the two substrates **110**. Alternatively, the elements **130**, **140**, **150**, **160**, and **170** can be formed in order, exchanging the substrates of one side and the other side. Alternatively, the elements **130**, **140**, **150**, **160**, and **170** can be formed on both substrates at the same time if proper equipment is available.

[0058] As illustrated in FIG. **4**G, in step S6 of forming the insulation layer **190**, the insulation layer **190** is formed the top side of the inter-layer dielectric layer **170**. The insulation layer **190** includes the protective film **192** and the flat film **194**. Here, the protective film **192** is formed first, and the flat film **194** is then formed on the protective film **192**. The protective film **192** covers the source/drain electrodes **180** and the inter-layer dielectric layer **170**, and protects the source/drain electrodes **180** and the gate electrode **150**. The via hole **208** is formed in advance by etching the area corresponding to the source/drain electrodes **180** in the protective film **192** and in the flat film **194**. The protective film **192** can be an inorganic film or an equivalent, but the present invention is not limited to just these materials. Moreover, the flat film **194** is formed on the protective film **192**. The flat film **194** makes the surface of the whole device flat, and can be made by coating or depositing at least one of benzo cyclo butane, acryl, or an equivalent, but the present invention is not limited to just these materials and methods.

[0059] After the insulation layer **190** is formed at the substrate **110** on one side, the insulation layer **190** can be formed on the other substrate **110** on the other side. That is, the insulation layer **190** is first completed on one of the two substrates **110** and then the insulation layer **190** is formed on the other substrate **110** facing the other way. Moreover, such an insulation layer **190** can be formed in order, exchanging the substrates of one side and the other side. Further, the insulation layer **190** can be formed on both substrates at the same time if proper equipment is available.

[0060] As illustrated in FIG. **4**H, in step S7 of forming the organic light emitting diode **200**, the organic light emitting diode **200** is formed on the insulation layer **190**. Specifically, the anode **202**, the organic light-emitting thin film **204**, and the cathode **206** are formed in order on insulation layer **190**.

[0061] The anode **202** can be made out of one of ITO (Indium Tin Oxide), ITO(Induim Tin Oxide)/Ag, ITO(Induim Tin Oxide)Ag/ITO(IZO:Indium Zinc Oxide), or an equivalent, but the present invention is not limited to just these materials. The anode **202** can be formed by RF sputtering, DC sputtering, ion beam sputtering, or a vacuum deposition method. After deposition, a desired area of anode **202** is formed through photo resist application, illuminating, developing, etching, and photo resist peeling processes. Here, the anode **202** is electrically connected to one of the source/drain electrodes **180** through the conductive via **208** that penetrates through the insulation layer **190**. Because the work function of the ITO is uniform, the hole-injecting wall on the organic light-emitting film **204** is used as a transparent conductive film, and the Ag reflects the light, especially from the organic light-emitting thin film **204**, in the front light-emitting type display.

[0062] As illustrated in FIG. **1**, the organic light-emitting thin film **204** can be made by forming a hole injecting layer (HIL) that improves the injection efficiency of holes, a hole transport layer (HTL) that regulates the speed of the movement of holes, an emitting layer (EML) that emits light by forming an exciton by the recombination of electrons and holes, an electron transport layer (ETL) that regulates the speed of the movement of electrons, and an electron injection layer (EIL) that improves the injection efficiency of electrons, but the present invention is not limited to this structure. The organic light-emitting thin film **204** can be made out of a wet coating method such as spin coating, deep coating, spraying, screen printing, or inkjet printing, or by a dry coating method such as sputtering or vacuum depositing.

[0063] The cathode **206** is formed on the surface of the electron injection layer of the organic light-emitting thin film **204**. The cathode **206** can be made by depositing at least one of Al, MgAg alloy, MgCa alloy, or an equivalent, but the present invention is not limited just to these materials for the cathode **206**, or to these methods of forming. For example, the cathode **206** can be made out of one of RF sputtering, DC sputtering, ion beam sputtering or vacuum deposition. Then, a desired area of cathode **206** is formed at the desired position through photo resist application, illuminating, developing, etching, and photo resist peeling processes.

[0064] Moreover, in case the front light-emitting type display, if the Al is used as the cathode **206**, the cathode needs to be very thin in order to make the light transmission rate high. In such a case, because the resistance gets high, the electron-injecting wall can be large. Hence, in such a case, at least one of MgAg alloy, MgCa alloy, or an equivalent whose electron-injecting wall is lower than that of Al can be used. Further, the cathode **206** can be made out of one of ITO and IZO. Because the MgAg alloy and the MgCa alloy are sensitive to surrounding environments, the isolation from the outside needs to be completely accomplished when these alloys are used.

[0065] Moreover, after the formation of such a cathode **206**, the pixel-defining film **210** is formed in such a manner that the boundary between the organic light emitting diodes **200** becomes clear. Such a pixel-defining film **210** is made by coating or depositing at least one of a polyimide or an equivalent. Here, after such coating and deposition, the organic light emitting diode **200** is exposed to the outside through photo resist application, illuminating, developing, etching, and photo resist peeling processes.

[0066] Moreover, the present invention has been described focusing on the front light-emitting display where the image is emitted towards an upper direction of the substrate, but the present invention is not limited to front emitting structures as backside light-emitting type or the both sides light-emitting type are possible.

[0067] After the organic light emitting diode **200** is formed on one substrate **110** at one side, an organic light emitting diode **200** can be formed on the other substrate **110** facing the other way.

[0068] That is, the organic light emitting diode **200** is completed first on one of the two substrates **110**, and the organic light emitting diode **200** is completed on the other of the two substrates **110** facing the opposite direction. Alternatively, such an organic light emitting diode **200** can be formed in order, exchanging the substrates of one side and the other side. Alternatively, the organic light emitting diode **200** can be completed at both substrates simultaneously of proper equipment is available.

[0069] As illustrated in FIG. **4**I, in step S**8** of separating substrates, the substrates **110** that have been attached and processed are individually separated. That is, the two substrates **110** are separated by removing the adhesives using a sawing tool or other tools. Here, the friction-preventing layer **220** still remains on one of the two substrates **110** after the separation of the substrates **110**. Further, though not illustrated in drawings, before or after sawing, the process of attaching a sealing substrate using a sealant can be included. Here, a transparent moisture absorbent material can be included in the sealing substrate in order to absorb moisture.

[0070] The present invention can be completed by the separation process of the two substrates **110**. That is, after the separation of the substrates **110**, the completed OLED **100** can be delivered as a product after the cell test, flexible printed circuit (FPC) bonding, module test, and reliability test. The cell test can be conducted by making a separate area for the cell test.

[0071] Further, in the case where the separation step S**8** of the substrates **110** becomes the last process, the friction-preventing layer **220** can still remain on the surface of one side of the substrate **110** of the completed OLED **100**. Such a friction-preventing layer **220** can serve to block the penetration of UV-rays, and protect the surface of the substrate **110** from the surrounding environments.

[0072] According to the present invention, for example, in case the thickness of the substrates **110** is less than 0.5 mm, since the two substrates **110** are attached for fabricating processes, the substrates **110** form a combined structure that is more than 1 mm thick during the fabrication processes. Hence, because the rigidity of the attached substrates **110** becomes high as a result of its combined thicknesses, the substrates are not bent and damaged, and the forming of the semiconductor layer and the forming of the organic light emitting diode can be easily achieved. Further, after the completion of products, the substrates **110** are separated, thereby producing slim substrates of about 0.5 mm.

[0073] As illustrated in FIG. **4**J, in step S**9** of removing the friction-preventing layer **220** from the upper substrate **110** occurs. The friction-preventing layer **220** is removed from the substrate **110** using a chemical solution or a grinder. Hence, when such a friction-preventing layer **220** is removed, no friction-preventing layer **220** remains on the surface of the substrate **110**, and the substrate becomes thinner. When the remaining friction-preventing layer **220** remains on the substrate **110**, it serves to block UV-rays and protect against outside impact. However, since the non-transmissive layer **160** has been formed within the OLED **100**, it is not absolutely necessary for the friction-preventing layer **220** to remain on the substrate **110** of the finished OLED **100**.

[0074] By using substrates **110** of a thickness between 0.05 mm and 1 mm, the OLED **100** according to the present invention can be easily applied to various slim electronic appliances as displays, such as a mobile phone, a personal digital assistant, a lap-top computer, a computer monitor, and a television. Further, by including a non-transmissive layer within the OLED, the OLED according to the present invention is made in such a manner that UV-rays do not impinge on the organic light emitting diode through the substrate during use. Further, by attaching two substrates of thicknesses between 0.05 and 1 mm together during fabrication, and performing semiconductor processes and organic thin film processes such as washing, etching, illuminating, developing, and heat treatment), the method of fabricating an OLED according to the present invention reduces time that takes in all processes by about 50%.

[0075] Further, by forming a non-transmissive layer underneath the organic light emitting diode, according to the fabricating method of the present invention, UV-rays are not easily transmitted to the other substrates of the opposite side. Further, by forming a friction-preventing layer to a predetermined thickness between attached substrates, and reinforcing rigidity according to the fabricating method of the present invention, the substrate is not bent or destroyed during fabrication. Further, by forming a friction-preventing layer between attached substrates, the fabricating method according to the present invention prevents contacts between substrates when two substrates are attached, thus preventing the damage of the substrates.

[0076] 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 can be made therein without departing from the spirit and scope of the present invention as defined by the following claims.

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

a substrate;

an organic light emitting diode, an insulating layer, a gate insulating layer and a semiconductor layer arranged on the substrate, the insulating layer being arranged between the organic light emitting diode and the gate insulating layer, the gate insulating layer being arranged between the insulating layer and the semiconductor layer; and

a non-transmissive layer arranged on the gate insulating layer, wherein the non-transmissive layer is adapted to block UV-rays.

2. The OLED of claim **1**, further comprising:

a buffer layer arranged on the substrate;

a gate electrode arranged on the gate insulating layer;

an inter-layer dielectric layer arranged on the gate electrode; and

source/drain electrodes arranged on the inter-layer dielectric layer, wherein the insulating layer is arranged between the source/drain electrode and the organic light emitting diode.

3. The OLED of claim **1**, wherein the non-transmissive layer is arranged at an outer side of the semiconductor layer.

4. The OLED of claim **2**, wherein the semiconductor layer and the source/drain electrodes are coupled together by a conductive contact that penetrates through the gate insulating layer and through the inter-layer dielectric layer, and the non-transmissive layer being arranged at an outer side of the conductive contact.

5. The OLED of claim **2**, wherein the non-transmissive layer is arranged beneath the source/drain electrodes.

6. The OLED of claim **1**, wherein the non-transmissive layer is arranged beneath the organic light emitting diode.

7. The OLED of claim **1**, wherein the non-transmissive layer is arranged at locations that do not correspond to the organic light emitting diode.

8. The OLED of claim **2**, wherein the non-transmissive layer comprises a same material as that of the gate electrode.

9. The OLED of claim **2**, wherein the non-transmissive layer is of a same thickness as that of the gate electrode.

10. The OLED of claim **1**, wherein the non-transmissive layer comprises a material selected from a group consisting of molybdenum (Mo), molybdenum tungsten (MoW), titanium (Ti), copper (Cu), aluminum (Al), aluminic neodymium (AlNd), chrome (Cr), molybdenum alloy, copper alloy, aluminum alloy, and doped poly silicon.

11. The OLED of claim **1**, wherein the non-transmissive layer is an UV-light protective agent.

12. The OLED of claim **1**, wherein the non-transmissive layer is comprised of a layer selected from a group consisting of an UV-ray non-transmissive metal, a transmissive UV-ray protective agent metal, and a non-transmissive UV-ray protective agent metal.

13. The OLED of claim **1**, wherein the non-transmissive layer is comprised of a material selected from a group consisting of chrome (Cr), chrome oxide (Cr_2O_3), aluminum (Al), gold (Au), silver (Ag), magnesium oxide (MgO) and silver alloy (ATD).

14. The OLED of claim **1**, wherein the non-transmissive layer is of a thickness between 500 Å and 3000 Å.

15. The OLED of claim **1**, wherein the substrate is of a thickness between 0.05 mm and 1 mm.

16. The OLED of claim **1**, wherein the substrate is comprised of a material selected from a group consisting of glass, plastic, polymer and steel.

17. The OLED of claim **1**, further comprising a friction-preventing layer arranged beneath the substrate.

18. The OLED of claim **1**, further comprising a friction-preventing layer of a thickness of 10 to 100 μm arranged beneath the substrate.

19. The OLED of claim **1**, further comprising a friction-preventing layer comprised of either an organic material or an inorganic material and arranged beneath the substrate.

20. A method of fabricating an organic light emitting display (OLED), comprising:

preparing two substrates;

attaching together the two substrates;

forming a buffer layer on outside sides of the two attached substrates;

forming a semiconductor layer on each buffer layer;

forming a non-transmissive layer on exterior sides of the semiconductor layers;

forming an insulating layer on each semiconductor layer and on each non-transmissive layer;

forming an organic light emitting diode on each insulation layer; and

separating the two attached substrates.

21. The method of claim **20**, further comprising, between the forming of the semiconductor layer and the forming of the non-transmissive layer:

forming a gate insulating layer on the semiconductor layer; and

forming a gate electrode on the gate insulating layer.

22. The method of claim **21**, further comprising:

forming a gate insulating layer on the semiconductor layer; and

forming a gate electrode on the gate insulating layer, wherein the forming of the non-transmissive layer occurs simultaneously with the forming of the gate electrode.

23. The method of claim **21**, wherein the forming of the non-transmissive layer is achieved by the forming of the non-transmissive layer on the gate insulating layer.

24. The method of claim **21**, wherein the non-transmissive layer is comprised of a same material as that of the gate electrode.

25. The method of claim **20**, wherein the non-transmissive layer is arranged beneath the organic light emitting diode.

26. The method of claim **20**, wherein the non-transmissive layer is comprised of a material selected from a group consisting of molybdenum (Mo), molybdenum tungsten (MoW), titanium (Ti), copper (Cu), aluminum (Al), aluminic neodymium (AlNd), chrome (Cr), molybdenum alloy, copper alloy, aluminum alloy, and doped poly silicon.

27. The method of claim **20**, wherein the non-transmissive layer is comprised of

an ultraviolet protective agent.

28. The method of claim **20**, wherein the non-transmissive layer is comprised of a material selected from a group consisting of a metal that UV-rays cannot penetrate, a permeable UV-ray protective agent, and a non-transmissive UV-ray protective agent.

29. The method of claim **20**, wherein the non-transmissive layer is comprised of a material selected from a group consisting of chrome (Cr), chrome oxide (Cr_2O_3), aluminum (Al), gold (Au), silver (Ag), magnesium oxide (MgO) and silver alloy (ATD).

30. The method of claim **20**, wherein the attaching of the substrates includes forming a friction-preventing layer between the substrates.

31. The method of claim **30**, further comprising removing the friction-preventing layer after the separating the substrates.

32. The organic light emitting display (OLED) set forth in claim **20**, comprised of: the substrates having a thickness not greater than one millimeter;

the non-transmissive layer being disposed to block UV-rays;

a gate insulating layer formed on one of the semiconductor layers; and

a gate electrode arranged on the gate insulating layer.

33. The organic light emitting display (OLED) set forth in claim **20**, comprised of:

the substrates having a thickness not greater than one millimeter;

the non-transmissive layer being disposed to block UV-rays at locations that do not correspond to the organic light emitting diode;

a gate insulating layer formed on one of the semiconductor layers;

a gate electrode arranged on the gate insulating layer;

an inter-layer dielectric layer arranged on the gate electrode;

a plurality of source/drains electrodes arranged on the inter-layer dielectric layer.

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摘要(译)

一种薄的有机发光器件，可用于移动电话和个人数字助理等薄型器件。有机发光显示器（OLED）包括阻挡紫外线的层，使得二极管和晶体管在生产期间和之后被屏蔽紫外线。为了防止在生产过程中破裂，将两个基板粘合在一起，并且在两个基板中的每一个上形成器件，从而提供更不易破裂的更厚的结构。生产完成后分离基材。