US 20140353602A1

(19) **United States**

(12) **Patent Application Publication**

KIM

(10) **Pub. No.: US 2014/0353602 A1**

(43) **Pub. Date: Dec. 4, 2014**

(54) **DISPLAY PANEL AND A METHOD OF MANUFACTURING THE SAME**

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(21) Appl. No.: **14/046,075**

(22) Filed: **Oct. 4, 2013**

(30) **Foreign Application Priority Data**

Jun. 4, 2013 (KR) 10-2013-0063874

Publication Classification

(51) **Int. Cl.**
H01L 27/32 (2006.01)

(52) **U.S. Cl.**
CPC ***H01L 27/3258*** (2013.01)
USPC **257/40**; 438/46

(57) **ABSTRACT**

A display panel may include an organic light emitting diode, a first film disposed on the organic light emitting diode and a second film comprising a fluoro polymer and disposed on the first film.

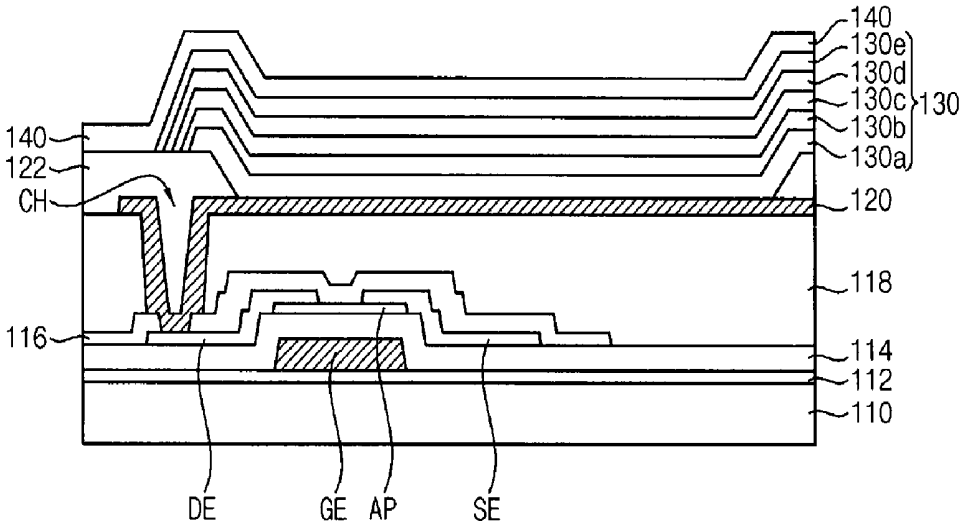


FIG. 1

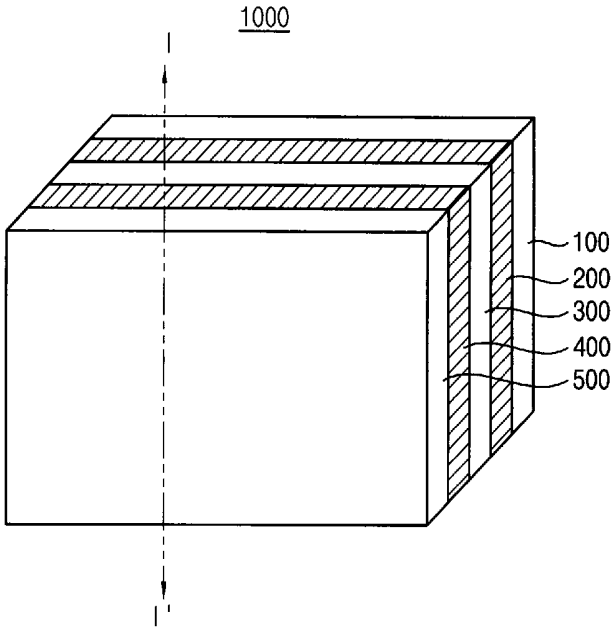


FIG. 2

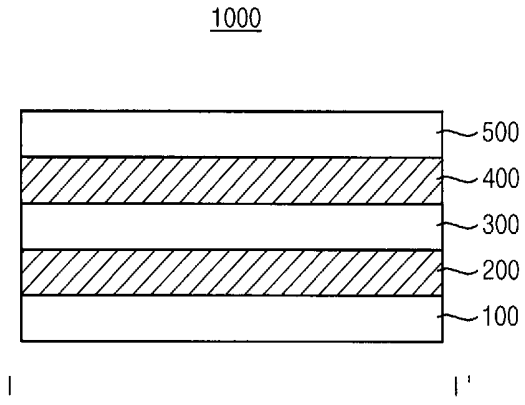


FIG. 3

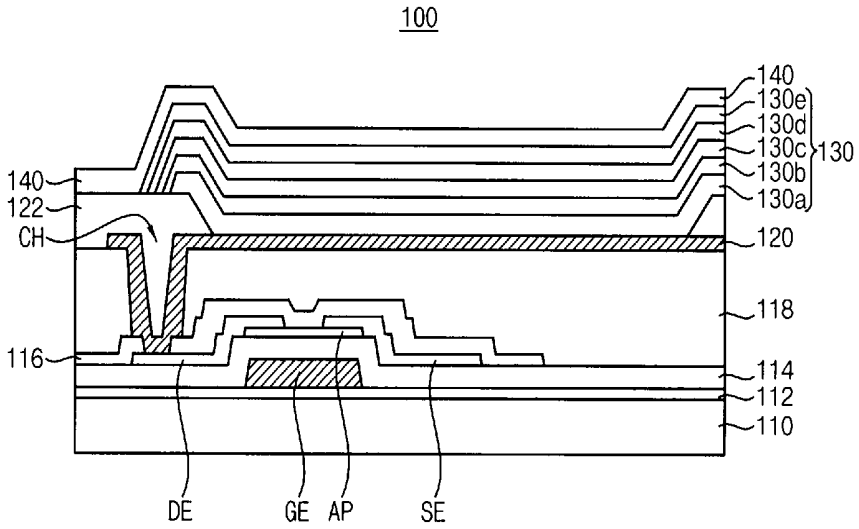

100
140
130e
130d
130c
130
130b
130a
140
122
CH
120
118
116
114
112
110
DE
GE
AP
SE

FIG. 4

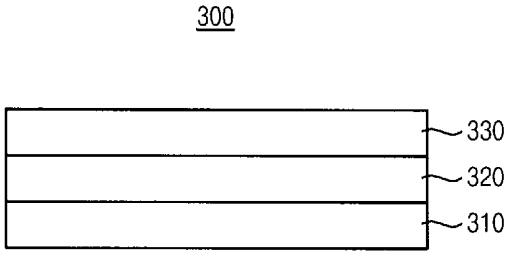

300
330
320
310

FIG. 5

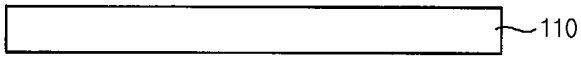


FIG. 6

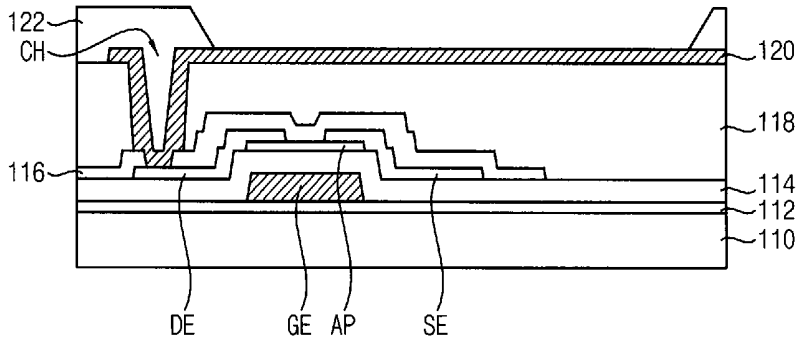


FIG. 7

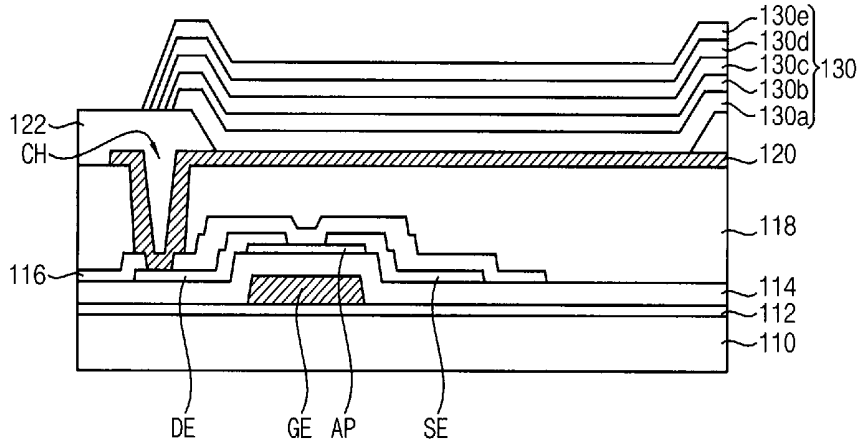

130e
130d
130c
130b
130a
130
122
CH
120
118
116
114
112
110
DE
GE
AP
SE

FIG. 8

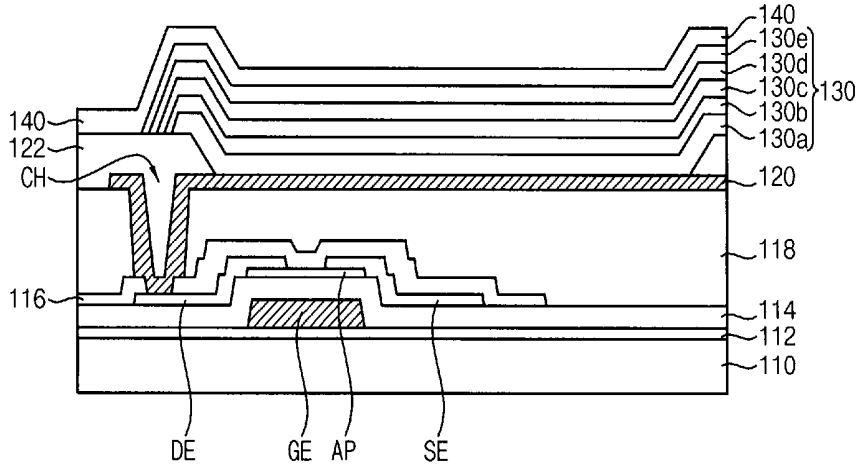

140
130e
130d
130c
130b
130a
130
140
122
CH
120
118
116
114
112
110
DE
GE
AP
SE

FIG. 9

FIG. 10

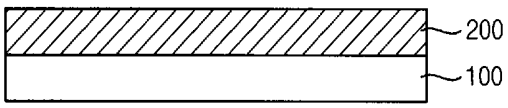


FIG. 11

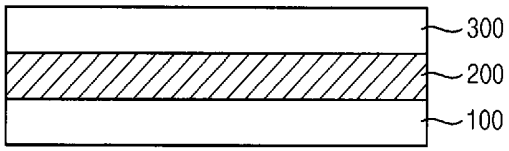


FIG. 12

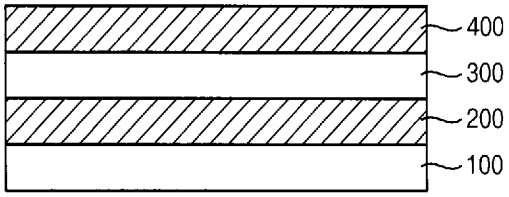
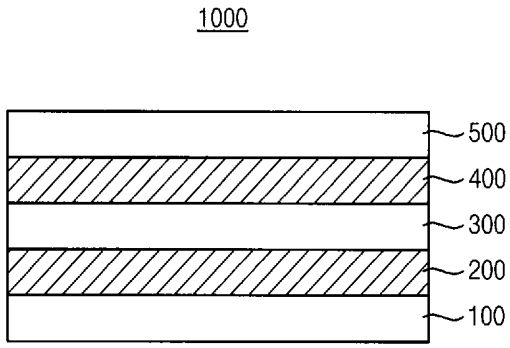


FIG. 13



DISPLAY PANEL AND A METHOD OF MANUFACTURING THE SAME

INCORPORATION BY REFERENCE TO ANY PRIORITY APPLICATIONS

[0001] Any and all applications for which a foreign or domestic priority claim is identified in the Application Data Sheet as filed with the present application are hereby incorporated by reference under 37 CFR 1.57.

[0002] This application claims priority under 35 U.S.C. §119 to Korean Patent Application No. 10-2013-0063874, filed on Jun. 4, 2013 in the Korean Intellectual Property Office (KIPO), the contents of which are herein incorporated by reference in its entirety.

BACKGROUND

[0003] 1. Field

[0004] Example embodiments relate to a display panel and a method of manufacturing the same. More particularly, example embodiments relate to a display panel including a film having improved transparency and a method of manufacturing the same.

[0005] 2. Description of the Related Technology

[0006] An image display device capable of displaying various information is important technology in the information and communication technology. The image display device has been developed to become thinner and lighter and to have portability and high performance. Recently, a flexible display capable of bending is being developed for spacing and convenience.

[0007] Intensity with respect to wavelength is important factor in flexible display quality evaluation. Recently, transparency of flexible display is also important factor in flexible display quality evaluation.

SUMMARY

[0008] One or more example embodiment provides a display panel capable of improved a transparency.

[0009] One or more example embodiment provides a method of manufacturing a display panel capable of improved a transparency.

[0010] According to example embodiments, a display panel may include an organic light emitting diode, a first film disposed on the organic light emitting diode and a second film including a fluoro polymer and disposed on the first film.

[0011] In an example embodiment, the display panel may further include a polarization film disposed between the organic light emitting diode and the first film.

[0012] In an example embodiment, the display panel may further include a touch screen panel disposed between the polarization film and the first film.

[0013] In an example embodiment, the first film may include polyimide, polystyrene, polyethylene terephthalate, polyethylenenaphthalate or polyethersulfone.

[0014] In an example embodiment, the fluoro polymer may include copolymer of tetrafluoroethylene and 2,2-bistrifluoromethyl-4,5-difluoro-1,3-dioxole, ethylene tetrafluoroethylene, fluorinated ethylene propylene, perfluoroalkoxy or polytetrafluoroethylene.

[0015] In an example embodiment, the organic light emitting diode may include a thin film transistor disposed on a base substrate, a first electrode on the thin film transistor, an organic light emitting layer disposed on the first electrode and including a hole injection layer, a hole transfer layer, a light emitting layer, an electron transfer layer and an electron injection layer and a second electrode on the organic light emitting layer.

[0016] According to another example embodiment, a method of manufacturing a display panel is provided. An organic light emitting diode may be formed. A first film may be formed on the organic light emitting diode. A second film including a fluoro polymer may be formed on the first film.

[0017] In an example embodiment, a polarization film may further provided on the organic light emitting diode.

[0018] In an example embodiment, a touch screen panel may further provided on the polarization film.

[0019] In an example embodiment, the first film may include polyimide, polystyrene, polyethylene terephthalate, polyethylenenaphthalate or polyethersulfone.

[0020] In an example embodiment, the fluoro polymer may include copolymer of tetrafluoroethylene and 2,2-bistrifluoromethyl-4,5-difluoro-1,3-dioxole, ethylene tetrafluoroethylene, fluorinated ethylene propylene, perfluoroalkoxy or polytetrafluoroethylene.

[0021] In an example embodiment, a mixture of the fluoro polymer and an organic solvent may be sprayed on the first film to form the second film.

[0022] In an example embodiment, the organic solvent may include methanol, ethanol, 1-propanol, 2-propanol, 1-butanol, 2-butanol, 2-methyl-1-butanol, 1-pentanol, cyclohexanol, benzene, toluene, xylene, mesitylene, tetrahydrofuran, dioxane, methyl isobutyl ketone, trichloroethylene, bromobenzene or chlorobenzene.

[0023] In an example embodiment, the fluoro polymer may be sprayed by a process such as a dispensing, a screen printing, a spin coating, a slit coating, a bar coating or a nozzle spraying to form the second film.

[0024] According to another example embodiment, a method of forming the organic light emitting diode is provided. A thin film transistor may be formed on a base substrate. A first electrode may be formed on the thin film transistor. An organic light emitting layer including a hole injection layer, a hole transfer layer, a light emitting layer, an electron transfer layer and an electron injection layer may be formed on the first electrode. A second electrode may be formed on the organic light emitting layer.

[0025] According to the example embodiments, the display panel may include the second film including fluoro polymer. Thus, durability and a transparency of a display panel may be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] The above and other features and advantages of the present embodiments will become more apparent by describing in detailed example embodiments thereof with reference to the accompanying drawings, in which:

[0027] FIG. **1** is a perspective view illustrating a display panel according to an example embodiment;

[0028] FIG. **2** is a cross-sectional view illustrating a display panel illustrated in FIG. **1**;

[0029] FIG. **3** is a cross-sectional view illustrating an organic light emitting diode illustrated in FIG. **1**;

[0030] FIG. **4** is a cross-sectional view illustrating a touch screen panel illustrated in FIG. **1**;

[0031] FIGS. **5** to **8** are cross-sectional views illustrating a method of manufacturing a display panel illustrated in FIG. **1**;

[0032] FIGS. **9** to **13** are cross-sectional views illustrating a method of manufacturing a display panel illustrated in FIG. **1**.

DETAILED DESCRIPTION

[0033] Hereinafter, example embodiments will be explained in detail with reference to the accompanying drawings.

[0034] In example embodiments, a display panel may be lower substrate of a display device including a sealing substrate, a color filter substrate etc. as an upper substrate. Examples of the display device may include a flat display device such as a liquid crystal display device, an organic light emitting display (OLED), an electrophoresis display device, etc. When the upper substrate of the display device is the color filter substrate, the upper substrate may include a black matrix capable of blocking a leaking light or color filter layers such as a red color filter, a green color filter and a blue color filter, etc., to display color images.

[0035] FIG. **1** is a perspective view illustrating a display panel according to an example embodiment. FIG. **2** is a cross-sectional view illustrating a display panel illustrated in FIG. **1**.

[0036] Referring to FIGS. **1** and **2**, a display panel **1000** includes an organic light emitting diode **100**, a polarization film **200**, a touch screen panel **300**, a first film **400** and a second film **500**.

[0037] Referring to FIG. **2**, the polarization film **200** is disposed between the organic light emitting diode **100** and the touch screen panel **300**. The polarization film **200** blocks reflection of a light that is externally provided to the organic light emitting diode **100**. A linear polarized light parallel with a polarization axis of the polarization film **200** is transmitted and a light not parallel with the polarization axis of the polarization film **200** is absorbed by the polarization film **200**. The polarization film **200** may include poly vinyl alcohol.

[0038] FIG. **3** is a cross-sectional view illustrating an organic light emitting diode illustrated in FIG. **1**.

[0039] Referring to FIG. **3**, the organic light emitting diode **100** includes a base substrate **110**, a film transistor TFT, a first electrode **120**, a bank layer **122**, an organic light emitting layer **130** and a second electrode **140**.

[0040] The base substrate **110** includes a transparent insulation substrate. Examples of the base substrate **110** may include a glass substrate, a quartz substrate, a transparent resin substrate, etc. Preferably, the base substrate **110** is a flexible substrate such as a transparent resin substrate. The transparent resin substrate may include polyamide resin, acryl resin, polyacrylate resin, polycarbonate resin, polyether resin, polyethylene terephthalate resin, sulfonic acid resin, etc.

[0041] The thin film transistor TFT includes a buffer layer **112**, a gate electrode GE, a first insulation layer **114**, a semiconductor pattern AP, a source electrode SE, a drain electrode DE, a passivation layer **116** and a second insulation layer **118**.

[0042] The buffer layer **112** protects the thin film transistor from impurities such as alkali ion leaking from the base substrate **110**. For example, the buffer layer **112** may include a silicon oxide (SiOx) or a silicon nitride (SiNx).

[0043] The gate electrode GE is disposed on the buffer layer **112**. For example, the gate electrode GE may include molybdenum, aluminum, chromium, gold, titanium, nickel, neodymium or copper.

[0044] The first insulation layer **114** is disposed on the gate electrode GE. For example, the first insulation layer **114** may include a silicon oxide (SiOx) or a silicon nitride (SiNx).

[0045] The semiconductor pattern AP is disposed on the first insulation layer **114** and overlaps the gate electrode GE. For example, the semiconductor pattern AP may include amorphous silicon or polycrystalline silicon.

[0046] The source electrode SE is spaced apart from the drain electrode DE. The source electrode SE and the drain electrode DE overlap the gate electrode GE. For example, the source electrode SE and the drain electrode DE may include molybdenum, aluminum, chromium, gold, titanium, nickel, neodymium or copper.

[0047] The passivation layer **116** entirely covers the source electrode SE and the drain electrode DE. The passivation **116** includes a contact hole CH to expose a portion of the drain electrode DE.

[0048] The second insulation layer **118** is disposed on the passivation layer **116**. For example, the second insulation layer **118** may include a silicon oxide (SiOx) or a silicon nitride (SiNx).

[0049] The first electrode **120** is disposed on the second insulation layer **118**. The first electrode **120** may function as an anode or a cathode. The first electrode **120** may be a reflective electrode or a transmission electrode according to light emitting type of the organic light emitting display device. When a first electrode **120** is a transmission electrode, the first electrode may include indium zinc oxide (IZO), indium tin oxide (ITO), gallium zinc oxide (GZO), zinc oxide (ZnOx), gallium oxide (GaOx), tin oxide (TiOx), indium oxide (InOx), etc. When a first electrode **120** is a reflection electrode, the first electrode may include aluminum(Al), silver(Ag), gold(Au), platinum(Pt), chromium(Cr), tungsten (W), molybdenum(Mo), titanium(Ti), palladium(Pd), etc.

[0050] When the organic light emitting display device has an active driving type, a switching structure may be disposed between the base substrate **100** and the first electrode **120**. For example, the switching structure may include a switching element such as a transistor and a plurality of insulation layers, and may be electrically connected to the first electrode **110**.

[0051] The bank layer **122** is disposed on the first electrode **120**. The bank layer **122** includes an opening portion to expose a portion of the first electrode **120**.

[0052] The organic light emitting layer **130** is disposed on the opening portion of the bank layer **122**. The organic light emitting layer **130** includes a hole injection layer **130***a*, a hole transfer layer **130***b*, a light emitting layer **130***c*, an electron transfer layer **130***d* and a electron injection layer **130***e*.

[0053] The hole injection layer **130***a* is disposed on the first electrode **120**. The hole injection layer **130***a* serves to move efficiently positive holes provided from the first electrode **120** to improve electrical characteristics. For example, the hole injection layer **130***a* may include CuPc(cupper phthalocyanine), PEDOT(poly(3,4)-ethylenedioxythiophene), PANI (polyaniline) or NPD(N,N-dinaphthyl-N,N'-diphenyl benzidine).

[0054] The hole transfer layer **130***b* is disposed on the hole injection layer **130***a*. For example, the hole transfer layer **130***b* may include NPD(N,N-dinaphthyl-N,N'-diphenyl benzidine), TPD(N,N'-bis-(3-methylphenyl)-N,N'-bis-(phenyl)-benzidine), s-TAD, MTDATA(4,4',4"-Tris(N-3-methylphenyl-N-phenyl-amino)-triphenylamine), etc.

[0055] The light emitting layer **130***c* may include a light emitting layer emitting a light such as red, green, blue or white color. The light emitting layer **130***c* may include a multiple light emitting layer including lamination of the light emitting layers.

[0056] The electron transfer layer **130***d* may improve electrical characteristics. For example, the electron transfer layer **130***d* may include Alq3(tris(8-hydroxyquinolino)aluminum), PBD, TAZ, Spiro-PBD, BAlq or SAlq.

[0057] The electron injection layer **130***e* serves to move electrons. For example, the electron injection layer **130***e* may include Alq3(tris(8-hydroxyquinolino)aluminum), PBD, TAZ, spiro-PBD, BAlq or SAlq.

[0058] The second electrode **140** is disposed on the organic light emitting layer **130**. The second electrode **140** may be may be an anode or a cathode. When the first electrode **120** is an anode, the second electrode **140** is a cathode. When the first electrode **120** is a cathode, the second electrode **140** is an anode. The second electrode **140** may be a reflective electrode or a transmission electrode according to type of the first electrode **120**. When a first electrode **120** may be a transmission electrode, a second electrode **140** may be a reflective electrode. The second electrode may include aluminum(Al), silver(Ag), gold(Au), platinum(Pt), chromium(Cr), tungsten (W), molybdenum(Mo), titanium(Ti), palladium(Pd), etc. When a first electrode **120** may be a reflective electrode, a second electrode **140** may be a transmission electrode. The second electrode **140** may include indium zinc oxide (IZO), indium tin oxide (ITO), gallium zinc oxide (GZO), zinc oxide (ZnOx), gallium oxide (GaOx), tin oxide (TiOx), indium oxide (InOx), etc.

[0059] FIG. **4** is a cross-sectional view illustrating a touch screen panel illustrated in FIG. **1**.

[0060] Referring to FIG. **4**, the touch screen panel **300** is disposed between the polarization film **200** and the first film **400**. The touch screen panel **300** includes a first conductive layer **310**, a polymer layer **320** and a second conductive layer **330**. The polymer layer **320** is disposed between the first conductive layer **310** and the second conductive layer **330**.

[0061] The first conductive layer **310** and the second conductive layer **330** are formed by a process such as a face-target sputtering, a thermal evaporatoration, a plasma sputtering or a flash evaporatoration.

[0062] When the first conductive layer **310** and the second conductive layer **330** are formed by the face-target sputtering, the first conductive layer **310** and the second conductive layer **330** may include ITO(Indium Tin Oxide) or IZO(Indium Zinc Oxide).

[0063] When the first conductive layer **310** and the second conductive layer **330** are formed by the thermal evaportatoration, the first conductive layer **310** and the second conductive layer **330** may include carbon nano tube(CNT).

[0064] When the first conductive layer **310** and the second conductive layer **330** are formed by the flash evaporatoration, the first conductive layer **310** and the second conductive layer **330** may include conductive polymer.

[0065] In another example embodiment, a connection line and a connection pad, which connect to the first conductive layer **310** and the second conductive layer **330**, may further disposed on the base substrate **100**.

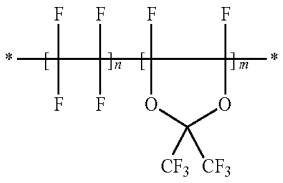
[0066] Referring to FIG. **2**, the first film **400** is disposed on the touch screen panel **300**. The second film **500** is disposed on the first film **400**.

[0067] The first film **400** may include polyimide, polystyrene, polyethylene terephthalate, polyethylenenaphthalate or polyethersulfone. These can be used alone or in a combination thereof.

[0068] The second film **500** may include a fluoro polymer such as Teflon. For example, the fluoro polymer may include copolymer of tetrafluoroethylene and 2,2-bistrifluoromethyl-4,5-difluoro-1,3-dioxole, ethylene tetrafluoroethylene, fluorinated ethylene propylene, perfluoroalkoxy or polytetrafluoroethylene. These can be used alone or in a combination thereof.

[0069] For example, the copolymer of tetrafluoroethylene and 2,2-bistrifluoromethyl-4,5-difluoro-1,3-dioxole is represented by following Chemical Formula 1.

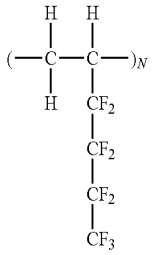
<Chemical Formula 1>



(wherein m and n are natural numbers)

[0070] For example, ethylene tetrafluoroethylene is represented by following Chemical Formula 2.

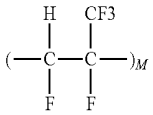
<Chemical Formula 2>



(wherein N is a natural number)

[0071] For example, fluorinated ethylene propylene is represented by following Chemical Formula 3.

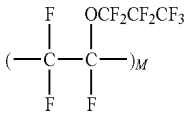
<Chemical Formula 3>



(wherein M is a natural number)

[0072] For example, perfluoroalkoxy is represented by following Chemical Formula 4.

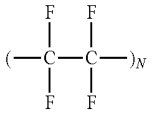
<Chemical Formula 4>



(wherein M is a natural number)

[0073] For example, polytetrafluoroethylene is represented by following Chemical Formula 5.

<Chemical Formula 5>



(wherein N is a natural number)

[0074] FIGS. **5** to **8** are cross-sectional views illustrating a method of manufacturing a display panel illustrated in FIG. **1**.

[0075] Referring to FIGS. **5** and **6**, an organic light emitting diode **100** is formed. For example, a thin film transistor TFT, a first electrode **120**, a bank layer **122**, an organic light emitting layer **130** and a second electrode **140** are sequentially formed on a base substrate **110**.

[0076] The base substrate **110** includes a transparent insulation substrate. Examples of the base substrate **110** may include a glass substrate, a quartz substrate, a transparent resin substrate, etc. Preferably, the base substrate **110** is a flexible substrate such as transparent resin substrate. The transparent resin substrate may include polyamide resin, acryl resin, polyacrylate resin, polycarbonate resin, polyether resin, polyethylene terephthalate resin, sulfonic acid resin, etc.

[0077] The thin film transistor TFT is formed on the base substrate **110**. A buffer layer **112**, a gate electrode GE, a first insulation layer **114**, a semiconductor pattern AP, a source electrode SE, a drain electrode DE, a passivation layer **116** and a second insulation layer **118** are sequentially formed. Thus, the thin film transistor TFT is formed.

[0078] The buffer layer **112** is formed on the base substrate **110**. The buffer layer **112** protects the thin film transistor from impurities such as alkali ion leaking from the base substrate **110**. For example, the buffer layer **112** may include a silicon oxide (SiOx) or a silicon nitride (SiNx).

[0079] The gate electrode GE is formed on the buffer layer **112**. For example, the gate electrode GE may include molybdenum, aluminum, chromium, gold, titanium, nickel, neodymium or copper.

[0080] The first insulation layer **114** is formed on the gate electrode GE. For example, the first insulation layer **114** may include a silicon oxide (SiOx) or a silicon nitride (SiNx).

[0081] The semiconductor pattern AP is formed on the first insulation layer **114** and overlaps the gate electrode GE. For example, the semiconductor pattern AP may be include amorphous silicon or polycrystalline silicon.

[0082] The source electrode SE and the drain electrode DE is formed on a portion of the first insulation layer **114**. The source electrode SE is spaced apart from the drain electrode DE. The source electrode SE and the drain electrode DE overlap the gate electrode GE. For example, the source electrode SE and the drain electrode DE may include molybdenum, aluminum, chromium, gold, titanium, nickel, neodymium or copper.

[0083] The passivation layer **116** is entirely formed on the source electrode SE and the drain electrode DE. A contact hole CH is formed to expose a portion of the drain electrode DE.

[0084] The second insulation layer **118** is formed on the passivation layer **116**. For example, the second insulation layer **118** may include a silicon oxide (SiOx) or a silicon nitride (SiNx).

[0085] The first electrode **120** is formed on the second insulation layer **118**. The first electrode **120** may function as an anode or a cathode. The first electrode **120** may be a reflective electrode or a transmission electrode according to light emitting type of the organic light emitting display device. When a first electrode **120** is a transmission electrode, the first electrode may include indium zinc oxide (IZO), indium tin oxide (ITO), gallium zinc oxide (GZO), zinc oxide (ZnOx), gallium oxide (GaOx), tin oxide (TiOx) or indium oxide (InOx), etc. When a first electrode **120** is a reflection electrode, the first electrode may include aluminum(Al), silver(Ag), gold(Au), platinum(Pt), chromium(Cr), tungsten (W), molybdenum(Mo), titanium(Ti), palladium(Pd), etc.

[0086] When the organic light emitting display device has an active driving type, a switching structure may be disposed between the base substrate **100** and the first electrode **120**. For example, the switching structure may include a switching element such as a transistor and a plurality of insulation layers, and may be electrically connected to the first electrode **110**.

[0087] The bank layer **122** is formed on the first electrode **120**. An opening portion is formed through the bank layer **122** to expose a portion of the first electrode **120**.

[0088] Referring to FIG. **7**, the organic light emitting layer **130** is formed on the opening portion of the bank layer **122**. A hole injection layer **130***a*, a hole transfer layer **130***b*, a light emitting layer **130***c*, an electron transfer layer **130***d* and a electron injection layer **130***e* of the organic light emitting layer **130** are sequentially formed.

[0089] The hole injection layer **130***a* is formed on the first electrode **120**. The hole injection layer **130***a* is entirely formed on the first electrode **120** by a process such as a slit coating, a bar coating or a spin coating.

[0090] The hole transfer layer **130***b* is formed on the hole injection layer **130***a*. The hole transfer layer **130***b* is entirely formed on the hole injection layer **130***a* by a process such as a slit coating, a bar coating or a spin coating.

[0091] The light emitting layer **130***c* is formed on the hole transfer layer **130***b*. The light emitting layer **130***c* may be formed on an upper surface of the hole transfer layer **130***b* by a liquid patterning process. For example, the liquid patterning process may include inkjet printing process, a nozzle printing process, T-jet process or electrostatic coating process.

[0092] The light emitting layer **130***c* may include a light emitting layer emitting a light such as red, green, blue or white color. The light emitting layer **130***c* may include a multiple light emitting layer including lamination of the light emitting layers.

[0093] The electron transfer layer **130***d* is formed on the light emitting layer **130***c*. The electron transfer layer **130***d* may be entirely formed by a process such as a slit coating, a bar coating or a spin coating.

[0094] The electron injection layer **130***e* is formed on the electron transfer layer **130***d*. The electron injection layer **130***e* may be entirely formed on the electron transfer layer **130***d* by a process such as a slit coating, a bar coating or a spin coating.

[0095] The hole injection layer **130***a*, the hole transfer layer **130***b*, the light emitting layer **130***c*, the electron transfer layer **130***d* and the electron injection layer **130***e* may include materials explained with reference to FIG. **3**.

[0096] Referring to FIG. **8**, the second electrode **140** is formed on the electron injection layer **130***e*. The second electrode **140** may be an anode or a cathode. When the first electrode **120** is an anode, the second electrode **140** is a cathode. When the first electrode **120** is a cathode, the second electrode **140** is an anode. The second electrode **140** may be a reflective electrode or a transmission electrode according to type of the first electrode **120**. When a first electrode **120** may be a transmission electrode, a second electrode **140** may be a reflective electrode. The second electrode may include aluminum(Al), silver(Ag), gold(Au), platinum(Pt), chromium (Cr), tungsten(W), molybdenum(Mo), titanium(Ti) or palladium(Pd), etc. When a first electrode **120** may be a reflective electrode, a second electrode **140** may be a transmission electrode. The second electrode **140** may include indium zinc oxide (IZO), indium tin oxide (ITO), gallium zinc oxide (GZO), zinc oxide (ZnOx), gallium oxide (GaOx), tin oxide (TiOx), indium oxide (InOx), etc. Thus, the organic light emitting diode **100** is formed.

[0097] FIGS. **9** to **13** are cross-sectional views illustrating a method of manufacturing a display panel illustrated in FIG. **1**.

[0098] Referring to FIGS. **9** and **10**, the polarization film **200** is formed on the organic light emitting diode **100**. The polarization film **200** blocks reflection of a light that is externally provided to the organic light emitting diode **100**. A linear polarized light parallel with a polarization axis of the polarization film **200** is transmitted and a light not parallel with the polarization axis of the polarization film **200** is absorbed by the polarization film **200**. The polarization film **200** may include poly vinyl alcohol.

[0099] Referring to FIG. **11**, the touch screen panel **300** is further provided. The touch screen panel **300** is provided by a process such as a face-target sputtering, a thermal evaporatoration, a plasma sputtering or a flash evaporatoration.

[0100] In another example embodiment, when the touch screen panel **300** is provided, a connection line and a connection pad may be further formed on the base substrate **100**.

[0101] Referring to FIG. **12**, the first film **400** is formed on the touch screen panel **300**. A material such as polyimide, polystyrene, polyethylene terephthalate, polyethylenenaphthalate or polyethersulfone is sprayed to form the first film **400**. These can be used alone or in a combination thereof. The first film **400** may be formed by a process such as a dispensing, a screen printing, a spin coating, a slit coating, a bar coating or a nozzle spraying.

[0102] Referring to FIG. **13**, the second film **500** is formed on the first film **400**.

[0103] A mixture of a fluoro polymer and an organic solvent are sprayed on the first film **400** to form the second film **500**.

[0104] For example, the organic solvent may include alcohol such as methanol, ethanol, 1-propanol, 2-propanol, 1-butanol, 2-butanol, 2-methyl-1-butanol, 1-pentanol, cyclohexanol, aliphatic hydrocarbons such as n-pentane, hexane, n-heptane, isooctane and dodecane, cycloaliphatic hydrocarbons such as cyclopentane and cyclohexane, aromatic hydrocarbons such as benzene, toluene, xylene, mesitylene, cyclic ether such as tetrahydrofuran and dioxane, ketone such as methyl isobutyl ketone, alkane such as trichloroethylene, or halogenated aromatic hydrocarbons such as bromobenzene and chlorobenzene. These can be used alone or in a combination thereof.

[0105] For example, the fluoro polymer may include copolymer of tetrafluoroethylene and 2,2-bistrifluoromethyl-4,5-difluoro-1,3-dioxole, ethylene tetrafluoroethylene, fluorinated ethylene propylene, perfluoroalkoxy and polytetrafluoroethylene. These can be used alone or in a combination thereof.

[0106] The fluoro polymer is sprayed on the first film **400** by a process such as a dispensing, a screen printing, a spin coating, a slit coating, a bar coating or a nozzle spraying. Thus, the second film **500** is formed.

[0107] A flexible display manufactured by a conventional liquid process hardly improves transparency. However, according to the example embodiments, a display panel is manufactured by a liquid process forming a second film including fluoro polymer. Thus, durability and transparency of a display panel may be improved.

[0108] The foregoing is illustrative of the embodiments and is not to be construed as limiting thereof. Although a few example embodiments have been described, those skilled in the art will readily appreciate that many modifications are possible in the example embodiments without materially departing from the novel teachings and advantages of the embodiments. Accordingly, all such modifications are intended to be included within the scope of the embodiments as defined in the claims. In the claims, means-plus-function clauses are intended to cover the structures described herein as performing the recited function and not only structural equivalents but also equivalent structures. Therefore, it is to be understood that the foregoing is illustrative of the embodiments and is not to be construed as limited to the specific example embodiments disclosed, and that modifications to the disclosed example embodiments, as well as other example embodiments, are intended to be included within the scope of the appended claims. The embodiments are defined by the following claims, with equivalents of the claims to be included therein.

What is claimed is:

1. A display panel comprising:

an organic light emitting diode;

a first film disposed on the organic light emitting diode; and

a second film comprising a fluoro polymer disposed on the first film.

2. The display panel of claim **1**, further comprising a polarization film disposed between the organic light emitting diode and the first film.

3. The display panel of claim **2**, further comprising a touch screen panel disposed between the polarization film and the first film.

4. The display panel of claim **1**, wherein the first film comprises at least one selected from the group consisting of polyimide, polystyrene, polyethylene terephthalate, polyethylene naphthalate and polyethersulfone.

5. The display panel of claim **1**, wherein the fluoro polymer comprises at least one selected from the group consisting of a copolymer of tetrafluoroethylene and 2,2-bistrifluoromethyl-4,5-difluoro-1,3-dioxole, ethylene tetrafluoroethylene, fluorinated ethylene propylene, perfluoroalkoxy and polytetrafluoroethylene.

6. The display panel of claim **1**, wherein the organic light emitting diode comprises:

a thin film transistor disposed on a base substrate;

a first electrode on the thin film transistor;

an organic light emitting layer disposed on the first electrode and comprising a hole injection layer, a hole transfer layer, a light emitting layer, an electron transfer layer and an electron injection layer; and

a second electrode on the organic light emitting layer.

7. A method of manufacturing a display panel comprising:
forming an organic light emitting diode;
forming a first film on the organic light emitting diode; and
forming a second film comprising a fluoro polymer on the first film.

8. The method of claim **7**, further comprising providing a polarization film on the organic light emitting diode.

9. The method of claim **8**, further comprising providing a touch screen panel on the polarization film.

10. The method of claim **7**, wherein the first film comprises at least one selected from the group consisting of polyimide, polystyrene, polyethylene terephthalate, polyethylene naphthalate and polyethersulfone.

11. The method of claim **7**, wherein the fluoro polymer comprises at least one selected from the group consisting of a copolymer of tetrafluoroethylene and 2,2-bistrifluoromethyl-4,5-difluoro-1,3-dioxole, ethylene tetrafluoroethylene, fluorinated ethylene propylene, perfluoroalkoxy and polytetrafluoroethylene.

12. The method of claim **11**, wherein a mixture of the fluoro polymer and an organic solvent is sprayed on the first film to form the second film.

13. The method of claim **12**, wherein the organic solvent comprises at least one selected from the group consisting of methanol, ethanol, 1-propanol, 2-propanol, 1-butanol, 2-butanol, 2-methyl-1-butanol, 1-pentanol, cyclohexanol, benzene, toluene, xylene, mesitylene, tetrahydrofuran, dioxane, methyl isobutyl ketone, trichloroethylene, bromobenzene and chlorobenzene.

14. The method of claim **12**, wherein the fluoro polymer is sprayed by a dispensing, screen printing, spin coating, slit coating, bar coating or nozzle spraying to form the second film.

15. The method of claim **7**, wherein forming the organic light emitting diode comprises:
forming a thin film transistor on a base substrate;
forming a first electrode on the thin film transistor;
forming an organic light emitting layer comprising a hole injection layer, a hole transfer layer, a light emitting layer, an electron transfer layer and an electron injection layer on the first electrode; and
forming a second electrode on the organic light emitting layer.

* * * * *

专利名称(译)	显示面板及其制造方法		
公开(公告)号	US20140353602A1	公开(公告)日	2014-12-04
申请号	US14/046075	申请日	2013-10-04
[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DISPLAY CO.，LTD.		
当前申请(专利权)人(译)	三星DISPLAY CO.，LTD.		
[标]发明人	KIM CHANG WOOK		
发明人	KIM, CHANG-WOOK		
IPC分类号	H01L27/32		
CPC分类号	H01L27/3258 H01L51/5253 H01L27/323 H01L27/3244 H01L51/5293 H01L2227/323 H01L2251/5323		
优先权	1020130063874 2013-06-04 KR		
外部链接	Espacenet USPTO		

摘要(译)

显示面板可包括有机发光二极管，设置在有机发光二极管上的第一膜和包含氟聚合物的第二膜，并设置在第一膜上。

〈Chemical Formula 1〉