(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 410 692 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
23.05.2012 Bulletin 2012/21

(21) Application number: **02738918.8**

(22) Date of filing: **14.06.2002**

(51) Int Cl.:
H01L 51/52 *(2006.01)*

(86) International application number:
PCT/KR2002/001127

(87) International publication number:
WO 2002/104077 (27.12.2002 Gazette 2002/52)

(54) **METHOD OF FABRICATING ORGANIC ELECTROLUMINESCENT DISPLAY**

VERFAHREN ZUR HERSTELLUNG EINER ORGANISCHEN ELEKTROLUMINESZENZANZEIGE

REALISATION D'UN AFFICHAGE ORGANIQUE ELECTROLUMINESCENT

(84) Designated Contracting States:
DE FR GB IT NL

(30) Priority: **16.06.2001 KR 2001034193**
16.08.2001 KR 2001049414
18.09.2001 KR 2001057741

(43) Date of publication of application:
21.04.2004 Bulletin 2004/17

(73) Proprietor: **Daewoo Electronics Service Co., Ltd**
Seoul 100-802 (KR)

(72) Inventors:
- **CHOI, Do-Hyun**
  Yangchun-ku
  Seoul 158-070 (KR)
- **CHOI, Kyung-Hee**
  Seoul 100-806 (KR)

(74) Representative: **Jacoby, Georg et al**
Samson & Partner
Widenmayerstrasse 5
80538 München (DE)

(56) References cited:
EP-A- 1 021 070
EP-A2- 0 751 699
WO-A-00/36665
WO-A-98/01910
JP-A- 11 121 166
JP-A- 2000 208 252
KR-A- 19990 041 051
US-A- 5 620 910

EP 1 410 692 B1

Printed by Jouve, 75001 PARIS (FR)

Description

Field of the Invention

[0001] The present invention relates to a method of fabricating an organic electroluminescent display (hereinafter abbreviated OELD) enabling to improve device characteristics and reliability by carrying out excimer laser annealing on a passivation layer without affecting any other parts of the device.

Background of the Related Art

[0002] As information communication technology is greatly developed, demands for electronic displaying means are highly increased in accordance with a variety of information societies. So does the demand for various displays. In order to meet the demands of the information society, for electronic display devices are required characteristics such as high-resolution, large-size, low-cost, high-performance, slim-dimension, and small-size and the like, for which new flat panel display(FPD) is developed as a substitution for the conventional cathode ray tube (CRT).

[0003] In the presently developed or used flat panel displays, there are Liquid Crystal Display(LCD), Light Emitting Display(LED), Plasma Display Panel(PDP), Vacuum Fluorescence Display(VFD), Electroluminescent Display(ELD) and the like.

[0004] Compared to the non-emissive device, ELD (electroluminescent display) attracts attention as a flat panel display having characteristics such as a response time faster than that of the non-emissive device such as LCD, an excellent brightness owing to self-luminescence, an easy fabrication from a simple structure, and a light weight/slim design. ELD is applied to a new flat panel display(FPD) as a next-generation substitute. ELD is generally divided into two categories, i.e. an organic electroluminescent display (hereinafter abbreviated OELD) and an inorganic electroluminescent display (hereinafter abbreviated IELD) in accordance with materials used for luminescent layers.

[0005] In the above-mentioned OELD, a conductive transparent anode layer, a hole injection layer, a hole transport layer, an organic electroluminescent layer, an electron transport layer, and a cathode layer are stacked successively on a transparent substrate formed of glass, quartz or the like. In this case, an organic material constructing the organic electroluminescent layer is very sensitive to oxidation, moisture, and contamination due to impurities, thereby needing an airtight passivation layer. Specifically, the cathode layer is formed of a metal having a low work function in order to reduce a driving voltage and achieve efficient electron injection. Such a metal is very sensitive to external oxygen and moisture. Namely, the oxidation of the metal constructing the cathode layer degrades luminescent characteristics of the device such as luminescent brightness, luminescent uniformity and the like badly, thereby reducing the life-time of OELD.

[0006] Moreover, when defects such as pinholes and the like exist on a metal surface of the cathode layer, oxygen, moisture and the like penetrate into the organic electroluminescent layer through these pinholes so as to degrade the organic electroluminescent layer. Therefore, the device characteristics are abruptly degraded. In order to secure the reliability of OELD, the organic electroluminescent layer as well as the pinholes in the cathode layer should be cut off from an external air so as to prevent the degradation.

[0007] One of the methods for shielding the organic electroluminescent layer of OELD from an external environment is using a metal cap.

[0008] FIG. 1 illustrates a cross-sectional view of an OELD using a metal cap according to a related art.

[0009] Referring to FIG. 1, an OELD 10 using a metal cap 20 is fabricated in a manner that an anode layer 12 formed of a conductive transparent material is stacked on a transparent substrate 11. And, on the anode layer 12 successively stacked are a hole injection layer 13, a hole transport layer 14, an organic electroluminescent layer 15, an electron transport layer 17, and a cathode layer 18. The anode, hole injection, hole transport, organic electroluminescent, electron transport, and cathode layers 12, 13, 14, 15, 17, and 18 stacked on the transparent substrate 11 are sealed using a metal cap 20 having a desiccant 19 at a center inside and a sealant 21.

[0010] In the OELD 10 having the above-constructed metal cap 20, when a voltage is applied between the anode layer 12 and the cathode layer 18, holes are injected into the organic electroluminescent layer 15 through the hole injection layer 13 and hole transport layer 14 while electrons are injected thereto through the electron transport layer 17. Thus, the organic electroluminescent layer 15 emits lights as the holes and electrons are combined to each other. In this case, the hole injection, hole transport, and electron transport layers 13, 14, and 17 play an auxiliary role in increasing a luminescent efficiency of OELD.

[0011] Unfortunately, the metal cap having the desiccant is left apart from a surface of the cathode layer in the related art. When the metal cap fails to secure 100% sealing by the sealant, the organic electroluminescent and cathode layers become contacted with oxygen and moisture so as to cause the degradation. Thus, it is difficult to protect the device completely only with the desiccant existing in part. Moreover, steps of attaching the desiccant and metal cap to the OELD are very complicated.

[0012] Additionally, from JP 11121166 a sealant curing exposure device for an organic electroluminescent element is known. In this device a packaging material is coated on a protection layer and a passivation layer is deposited by using a thermal growing method. The packaging material is a photo setting polymer, which is pho-

toset, i.e., hardened by a laser.

[0013] Further, WO 98/01910 A discloses an organic light emitting device which is encapsulated by a buffer layer comprising a silicon based polymer, such as siloxane or siloxane derivates. The buffer layer provides for protection against contamination, degradation, oxidation and the like and carries at least one second encapsulation layer.

[0014] In addition, EP 1 021 070 A discloses an organic electroluminescent device comprising a substrate, an organic electroluminescent structure formed on the substrate and a sealing sheet for sealing up the organic electroluminescent structure. For fixing the sealing sheet onto the substrate and the outside of the electroluminescent structure a desiccant is used.

SUMMARY OF THE INVENTION

[0015] Accordingly, the present invention is directed to a method of fabricating an organic electroluminescent display that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0016] An object of the present invention is to provide a method of fabricating an organic electroluminescent display (hereinafter abbreviated OELD) enabling to improve device characteristics and reliability by preventing organic electroluminescent and cathode layers from being contacted with oxygen, moisture and the like.

[0017] This is provided by the invention according to the claims.

[0018] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0019] To achieve these and other advantages, and in accordance with the purpose of the present invention as embodied and broadly described, a method of fabricating an organic electroluminescent display according to the present invention includes the steps of forming an anode layer, an organic electroluminescent layer, and a cathode layer successively on a transparent substrate, and depositing a passivation layer having a silicon based insulating layer on the transparent substrate and the successively stacked layers, and characterized in that the silicon based insulating layer is annealed locally to crystallize upper portion thereof.

[0020] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

[0022] In the drawings:

FIG. 1 illustrates a cross-sectional view of an OELD according to a related art;

FIG. 2 illustrates a cross-sectional view of an OELD according to the present invention;

FIGS. 3A to FIGS. 3C illustrate cross-sectional views of fabricating an OELD according to the present invention; and

FIG. 4A and FIG. 4B illustrate network structure for chemical bonds of silicon nitride layers.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Where possible, the same reference numerals will be used to illustrate like elements throughout the specification.

[0024] FIG. 2 illustrates a cross-sectional view of an OELD according to the present invention.

[0025] Referring to FIG. 2, an OELD 100 having a thin passivation layer according to the present invention is fabricated in a manner that an anode layer 112, a hole injection layer 113, a hole transport layer 114, an organic electroluminescent layer 115, an electron transport layer 117, and a cathode layer 118 are stacked on a transparent substrate 111 successively. And, the OELD 100 according to the present invention further includes a thin passivation layer 130 stacked on the cathode layer 118 formed of a silicon based insulating material enabling to exclude oxygen, moisture and the like.

[0026] FIGS. 3A to FIGS. 3C illustrate cross-sectional views of fabricating an OELD according to the present invention.

[0027] Referring to FIG. 3A, a plurality of anode layers 112 are formed on a transparent substrate 111. In this case, the transparent substrate 111 is formed of one of glass, quartz glass, transparent plastic, and the like.

[0028] Preferably, the anode layer 112 is deposited by one of chemical vapor deposition, sputtering, thermal evaporation, and electron beam deposition, and is patterned by photolithography. And, the anode layer(s) is formed 100 to 10,000Å thick, and preferably, 100 to 3,000Å thick. A transmissivity of the anode layer 112 for visible rays is preferably close to 100%. And, at least 30% of the transmission rate is acceptable.

[0029] Preferably, the anode layer 112 is formed of

one of metal, alloy, electrically conductive chemical compound and their mixtures, of which work function is at least 4.0 eV. For instance, the anode layer 112 is formed of one of ITO (indium tin oxide), IXO (indium-doped zinc oxide), TO (tin oxide), Sn, Au, Pt, Pd, and their mixtures constructing a single layer or double layers.

[0030] On the anode layer 112 stacked successively as organic layers are a hole injection layer 113, a hole transport layer 114, an organic electroluminescent layer 115, and an electron transport layer 117.

[0031] When the organic layers are formed of a low molecule-based organic material, the hole injection, hole transport layer, organic electroluminescent layer, and electron transport layers 113, 114, 115, and 117 are stacked 200~600Å, 200~600Å, 400~500Å, and about 600Å thick, respectively.

[0032] The hole injection layer 113 is formed of an organic material having star-burst type molecules such as metallophthalocyanine, metal-free-phthalocyanine, 4,4', 4"-tris(di-p-methylphenylamino)triphenylamine or the like. The hole injection layer 113 injects holes of the anode layer 112 into the hole transport layer 114 when an electric field is applied thereto.

[0033] The hole transport layer 114 is formed of one of organic materials such as N,N'-diphenyl-N,N'-(4-methylphenyl)-1, 1'-biphenyl-4,4'-diamine, and 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl. And, the hole transport layer 114 transports the injected holes to the organic electroluminescent layer 115 by the electric field.

[0034] The organic electroluminescent layer 115 is formed of the organic material such as tris(8-hydroxyquinoline)aluminum, tris(4-methyl-8-hydroxyquinoline)aluminum, 3-(2'-benzthiazolyl)-7-N,N-diethylaminocoumarine, 9,18-dihydroxybenzo[h]benzo[8]quino[2,3-b]acrydyne-7,16-dione, 4,4'-bis(2,2'-diphenyl-ethene-4-yl)-diphenyl, phenylene and the like. The organic electroluminescent layer 115 generates the emission of light due to the recombination between holes transported from the hole transport layer 114 and electrons transported from the electron transport layer 117.

[0035] The electron transport layer 117 is formed of one of organic materials such as tris(8-hydroxyquinoline) aluminum, tris(8-hydroxyquinoline)gallium, 1,3-bis[5-(p-tertiary- buphylphenyl)- 1,3,4- oxadiasole- 2- yl] benzene and the like. And, the electron transport layer 117 transfers the electrons injected from the cathode layer 118 to the organic electroluminescent layer 115 when an electric field is applied thereto.

[0036] So far, low molecule-based organic materials are explained.

[0037] In the case of an electroluminescent device using polymer (high molecule-based) materials, stacked organic layers constructed with a buffer layer such as PEDOT, PSS or the like and a luminescent layer such as poly(phenylvinylene) derivatives, PPV or the like are formed using one of spin-coating, dipping, deposition and the like. In this case, the buffer and organic electroluminescent layers are formed 200~900Å and 200~900Å thick, respectively,

[0038] The cathode layer 118, which is formed of a metal of which work function is lower than 4.0 eV such as magnesium, aluminum, indium, lithium, sodium, silver, is constructed with a single layer, double layers, or a layer of their mixtures. And, the cathode layer 118 is formed 100 to 10,000Å, preferably, 100 to 3,000Å thick using sputtering, thermal evaporation, electron beam deposition, or chemical vapor deposition (CVD) .

[0039] In order to increase an electron injection efficiency, LiF, CsF, Li_2O, Li-Al alloy or the like may be formed 1 to 100Å thick between the cathode and electron transport layers 118 and 117.

[0040] Referring to FIG. 3B, a passivation layer 130 is deposited on the transparent substrate 111 including the cathode layer 118. The passivation layer 130 is constructed with at least one layer using selectively one of SiO_2, SiO_xN_y, Si_3N_4, and SiN_x to a thickness d1 of 100 to 50,000Å thick, preferably, 100 to 3,000Å. Thus, the passivation layer 130 is formed of a silicon based insulating material enabling to shield the organic electroluminescent and cathode layers from being degraded by the penetration of oxygen, moisture and the like. The passivation layer 130 is formed or deposited by CVD, sputtering, thermal evaporation or E-beam deposition.

[0041] When the passivation layer 130 is formed of the silicon based insulating material using CVD, a deposition temperature of layer is 25 to 300°C, inert gas is used as a carrier gas, SiN_x uses SiH_4, NH_3, and N_2 as reaction gases, SiON uses SiH_4, N_2O, NH_3, and N_2 as reaction gases, and SiO_2 uses SiH_4 and O_2 as reaction gases.

[0042] When the passivation layer 130 is formed of the silicon based insulating material using sputtering, a deposition temperature of layer is 25 to 300°C, inert gas is used as a carrier gas, and SiN_x, SiON, and SiO_2 use targets of SiN_x, SiON, and SiO_2, respectively.

[0043] Besides, a silicon based insulating inorganic material, a resin layer, and a silicon based inorganic material are successively deposited so as to form the passivation layer 130. Alternatively, the passivation layer 130 is formed by stacking a resin layer, a silicon based insulating inorganic material, and a resin layer successively.

[0044] Referring to FIG. 3C, in order to remove the defect of the passivation layer 130, thermal treatment is carried out. As the passivation layer 130 is not formed by a thermal growing method but deposited by CVD or sputtering, a plurality of incomplete chemical bonds between silicon and oxygen/nitrogen atoms occur. Such an incomplete bonds between atoms generates a plurality of dangling bonds and porosity, thereby bringing about the defect of the passivation layer 130. Namely, such a defect at the passivation layer provides paths through which oxygen and moisture pass. Thus, the defect should be removed therefrom through crystallization process.

[0045] A temperature of the thermal treatment to remove the defect of the passivation layer 130 deposited of the silicon based chemical compounds is 700 to 1100°C. Such a temperature is enough to affect other

elements including the organic electroluminescent layer of the OELD fatally. Therefore, the present invention carries out a local thermal treatment process using excimer laser annealing method. Namely, a thermal treatment is performed on a portion of the passivation layer 130 in a certain thickness from the surface of the passivation layer 130 using excimer laser annealing method in order that the thermal treatment does not affect any other elements and the treated portion of the passivation layer 130 is annealed at a high temperature for an instant.

[0046] In this case, the thermal treatment is carried out using an excimer laser of Ar_2, Kr_2, Xe_2, ArF, KrF, XeCl, or F_2. Table 1 illustrates wavelengths of the respective excimer lasers, where annealing power of the excimer laser is 10~2000mJ/cm^2, an ambient temperature is 25~300°C, and the annealing is carried out for several minutes. And, an instant temperature of annealing the passivation layer 130 is a temperature enabling the crystallization. The annealing is carried out at least once.

[0047] As a result of the annealing having been performed, a high-density uniform layer 131 having a network structure consisting of silicon and oxygen (or nitrogen) is formed. In the high-density uniform layer 131, a porosity and a hydrogen content coupled with the dangling bonds are minimized. In this case, the high-intensity uniform layer 131 is formed to have a thickness d2 of 10 to 10,000Å, and preferably, 100 to 2,000Å, after the annealing. Therefore, the network structure and the reduced hydrogen content prevent the organic electroluminescent and cathode layers 115 and 118 from being degraded due to the penetration of moisture and oxygen from external environments.

[0048] The species and wavelengths of the excimer lasers used for annealing the surface of the passivation layer 130 are shown in Table 1, where the annealing may be carried out at least once.

Table. 1

Excimer laser	Wavelength
Ar2	126nm
Kr2	146nm
Xe2	172nm
ArF	193nm
XeF	351nm
KrF	250nm
XeCl	308nm
F2	**157nm**

[0049] Besides, in order to prevent the degradation caused by outgassing materials generated inside the device, a metal oxide layer(not shown in the drawing) as a desiccant layer, of which desiccating and adsorbing properties are excellent, may be inserted between the cathode and passivation layers 118 and 130 using one of CaO, Y_2O_3, MgO and the like. The metal oxide layer is formed 100~50,000Å thick, more preferably, 200~10,000Å thick.

[0050] Thereafter, an external encapsulation cap may be formed over the transparent substrate 111 by assembly/sealing so as to cover the above-described structure using one of glass, AS resin, ABS resin, polypropylene (PP), polystyrene(HIPS), polymethyl-meta-crylic acid (PMMA), polycarbonate, metal and the like in order to strengthen the mechanical intensity of the passivation layer 130.

[0051] FIG. 4A and FIG. 4B illustrate network structure for chemical bonds of silicon nitride layers.

[0052] Referring to FIG. 4A, the passivation layer 130 formed of the silicon based insulating material is not formed by a thermal growing method but deposited by one of CVD, sputtering, and thermal evaporation. Thus, silicon and nitrogen atoms fail to complete their chemical bonds, thereby providing a plurality of dangling bonds 140 failing to be bonded to others. Therefore, a plurality of dangling bonds 140 exist in the passivation layer 130 and a property of the passivation layer 130 becomes porous. Moreover, the dangling bonds 140 come into forming chemical bonds with hydrogen atoms so as to increase the hydrogen content in the passivation layer 130 as well. The dangling bonds 140 and porosity of the passivation layer cause the penetration of oxygen and moisture.

[0053] Referring to FIG. 4B, the passivation layer 130 is annealed using an excimer laser. The passivation layer 130 is abruptly crystallized so as to disconnect the chemical bonds between the dangling bonds and hydrogen atoms and form new chemical bonds 141 between silicon and nitrogen atoms. Thus, the removal of the dangling bonds 140 reduces the hydrogen content as well as minimizes the porosity of the passivation layer 130. Therefore, the uniform passivation layer 130 enabling to restrain the penetration of oxygen and moisture is attained.

[0054] Accordingly, the present invention provided with the network structure and the reduced hydrogen content enables to prevent the organic electroluminescent and cathode layers from being degraded due to the penetration of moisture and oxygen from outside by carrying out the excimer laser annealing locally on the passivation layer formed of silicon and nitrogen/oxygen without affecting other elements.

[0055] Moreover, considering the case of the related art requiring at least 2 to 5 hours for forming a layer enabling to exclude the external oxygen and moisture by CVD, the present invention enables to reduce a process time greatly using excimer laser annealing of which process time requires only several minutes which are relatively short.

[0056] The foregoing embodiments are merely exemplary and are not to be construed as limiting the present invention.

Claims

1. A method of fabricating an organic electroluminescent display, comprising the steps of:

   forming an anode layer (112), an organic electroluminescent layer (115), and a cathode layer (118) successively on a transparent substrate (111); and
   depositing a passivation layer (130) having a silicon based insulating layer on the transparent substrate (111) and the successively stacked layers (112, 115, 118); and,

   characterized in that
   the silicon based insulating layer is annealed locally to crystallize upper portion thereof.

2. The method of claim 1, wherein a hole injection layer (113) and a hole transport layer (114) are further inserted between the anode and organic electroluminescent layers (112, 115).

3. The method of claim 1, wherein an electron transport layer (117) is further inserted between the organic electroluminescent and cathode layers (115, 118).

4. The method of claim 1, wherein a desiccant layer is further inserted between the cathode and passivation layers (115, 130).

5. The method of claim 4, wherein the desiccant layer is formed using selectively one of CaO, Y_2O_3, and MgO.

6. The method of claim 1, wherein the passivation layer (130) is formed using selectively one of SiO_x, SiO_xN_y, and SiN_x to form a single layer or using selectively at least two of SiO_x, SiO_xN_y, and SiN_x to form at least double layers.

7. The method of claim 1, wherein the annealing is carried out using excimer laser.

8. The method of claim 7, wherein an annealing power of the excimer laser is 10~2000mJ/cm^2, an ambient temperature is 25~300°C, and the annealing is carried out for several minutes.

9. The method of claim 7, wherein the excimer laser is one of lasers using Ar_2, Kr_2, Xe_2, ArF, KrF, XeCl, or F_2.

10. The method of claim 1, wherein the passivation layer (130) is formed by stacking a first silicon based inorganic material layer, a resin layer, and a second silicon based inorganic material layer.

11. The method of claim 1, wherein the passivation layer (130) is formed by stacking a first resin layer, a silicon based inorganic material layer, and a second resin layer.

12. The method of claim 1, wherein an external encapsulation cap is further formed on the passivation layer (130) by assembly/sealing.

13. The method of claim 12, wherein the external encapsulation cap is formed using one of glass, AS resin, ABS resin, polypropylene(PP), polystyrene(HIPS), polymethyl-meta-crylic acid(PMMA), polycarbonate, and a metal.

Patentansprüche

1. Verfahren zum Herstellen eines organischen elektrolumineszierenden Displays, umfassend die Schritte:

   Bilden einer Anodenschicht (112), einer organisch elektrolumineszierenden Schicht (115) und einer Kathodenschicht (118) aufeinanderfolgend auf einem transparenten Substrat (111); und
   Aufbringen einer Passivierungsschicht (130) umfassend eine silikonbasierte Isolierschicht auf dem transparenten Substrat (111) und den aufeinanderfolgend übereinander angeordneten Schichten (112, 115, 118); und
   dadurch gekennzeichnet, dass
   die silikonbasierte Isolierschicht lokal getempert wird, um obere Bereiche davon zu kristallisieren.

2. Verfahren gemäß Anspruch 1, bei dem weiter eine Loch-Injektionsschicht (113) und eine Lochtransportschicht (114) zwischen den anoden- und organischen elektrolumineszierenden Schichten (112, 15) eingefügt sind.

3. Verfahren gemäß Anspruch 1, bei dem weiter eine Elektronen-Transportschicht (117) zwischen der organischen elektrolumineszierenden und den Kathodenschichten (115, 118) eingefügt ist.

4. Verfahren gemäß Anspruch 1, bei dem weiter eine Trocknungsmittel-Schicht zwischen der organischen elektrolumineszierenden und den Passivierungsschichten (115, 130) eingefügt ist.

5. Verfahren gemäß Anspruch 1, bei dem die Trocknungsmittel-Schicht unter Verwendung wahlweise von einem von CaO, Y_2O_3, und MgO gebildet wird.

6. Verfahren gemäß Anspruch 1, bei dem die Passivie-

rungsschicht (130) unter wahlweiser Verwendung von einem von SiO_x, SiO_xN_y und SiN_x gebildet wird, um eine einzelne Schicht zu bilden oder unter Verwendung von wahlweise wenigstens zwei von SiO_x, SiO_xN_y und SiN_x, um wenigstens Doppelschichten zu bilden.

7. Verfahren gemäß Anspruch 1, bei dem die Temperung unter Verwendung eines Excimer-Lasers ausgeführt wird.

8. Verfahren gemäß Anspruch 1, bei dem eine Temper-Energie von dem Excimer-Lasers zwischen 10 bis 2000 mJ/cm_2 beträgt, eine Umgebungstemperatur 25 bis 300°C beträgt und das Tempern für mehrere Minuten ausgeführt wird.

9. Verfahren gemäß Anspruch 1, bei dem der Excimer-Laser einer von Lasern ist, der Ar_2, Kr_2, Xe_2, Arf, KrF, XeCl oder F_2 verwendet.

10. Verfahren gemäß Anspruch 1, bei dem die Passivierungsschicht (130) über ein übereinander Anordnen einer ersten silikonbasierten anorganischen Materialschicht, einer Harzschicht und einer zweiten silikonbasierten anorganischen Materialschicht gebildet wird.

11. Verfahren gemäß Anspruch 1, bei dem die Passivierungsschicht (130) über ein Schichten einer ersten Harzschicht, einer silikonbasierten anorganischen Materialschicht und einer zweiten Harzschicht gebildet wird.

12. Verfahren gemäß Anspruch 1, bei dem eine äußere Umhüllungsabdeckung weiter an der Passivierungsschicht (130) über eine Anordnung/Dichtung gebildet wird.

13. Verfahren gemäß Anspruch 12, bei dem die äußere Umhüllungsabdeckung unter Verwendung von Glas, AS-Harz, ABS-Harz, Polypropylen (PP), Polystyren (HIPS); Polymethyl-Metacrylat-Säure (PMMA), Polycarbonat und einem Metall gebildet wird.

Revendications

1. Procédé de fabrication d'un affichage électroluminescent organique, comprenant les étapes consistant à :

former une couche d'anode (112), une couche électroluminescente organique (115), et une couche de cathode (118) successivement sur un substrat transparent (111) ; et
déposer une couche de passivation (130) comprenant une couche isolante à base de silicium sur le substrat transparent (111) et les couches (112, 115, 118) successivement empilées ; et
caractérisé en ce que
la couche isolante à base de silicium est localement recuite pour cristalliser sa partie supérieure.

2. Procédé selon la revendication 1, dans lequel une couche d'injection de trous (113) et une couche de transport de trous (114) sont en outre insérées entre la couche d'anode et la couche électroluminescente organique (112, 115).

3. Procédé selon la revendication 1, dans lequel une couche de transport des électrons (117) est en outre insérée entre la couche électroluminescente organique et la couche de cathode (115, 118).

4. Procédé selon la revendication 1, dans lequel une couche déshydratante est en outre insérée entre la couche de cathode et la couche de passivation (115, 130).

5. Procédé selon la revendication 4, dans lequel la couche déshydratante est formée en utilisant sélectivement l'un de CaO, Y_2O_3 et MgO.

6. Procédé selon la revendication 1, dans lequel la couche de passivation (130) est formée en utilisant sélectivement l'un de SiO_x, SiO_xN_y et SiN_x pour former une couche unique ou en utilisant sélectivement au moins deux de SiO_x, SiO_xN_y et SiN_x pour former des couches au moins doubles.

7. Procédé selon la revendication 1, dans lequel le recuit est réalisé en utilisant un laser excimère.

8. Procédé selon la revendication 7, dans lequel la puissance de recuit du laser excimère est de 10 à environ 2000 mJ/cm^2, la température ambiante est de 25 à environ 300 °C, et le recuit est réalisé pendant plusieurs minutes.

9. Procédé selon la revendication 7, dans lequel le laser excimère est l'un des lasers utilisant Ar_2, Kr_2, Xe_2, ArF, KrF, XeCl, ou F_2.

10. Procédé selon la revendication 1, dans lequel la couche de passivation (130) est formée par empilement d'une première couche de matériau inorganique à base de silicium, d'une couche de résine, et d'une seconde couche de matériau inorganique à base de silicium.

11. Procédé selon la revendication 1, dans lequel la couche de passivation (130) est formée par empilement d'une première couche de résine, d'une couche de matériau inorganique à base de silicium, et d'une

seconde couche de résine.

12. Procédé selon la revendication 1, dans lequel une couche d'encapsulation externe est en outre formée sur la couche de passivation (130) par assemblage/scellage.

13. Procédé selon la revendication 12, dans lequel la couche d'encapsulation externe est formée en utilisant un composé choisi parmi le verre, une résine AS, une résine ABS, un polypropylène (PP) un polystyrène (HIPS), un acide polyméthylméthacrylique (PMMA), un polycarbonate et un métal.

FIG. 1

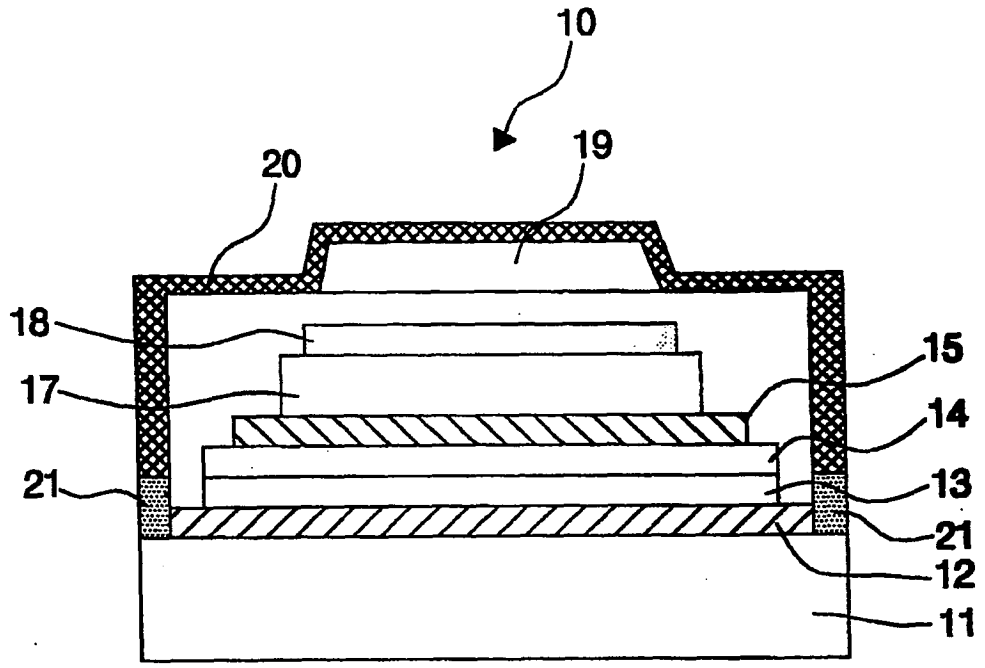

10
19
20
18
17
21
15
14
13
21
12
11

FIG. 2

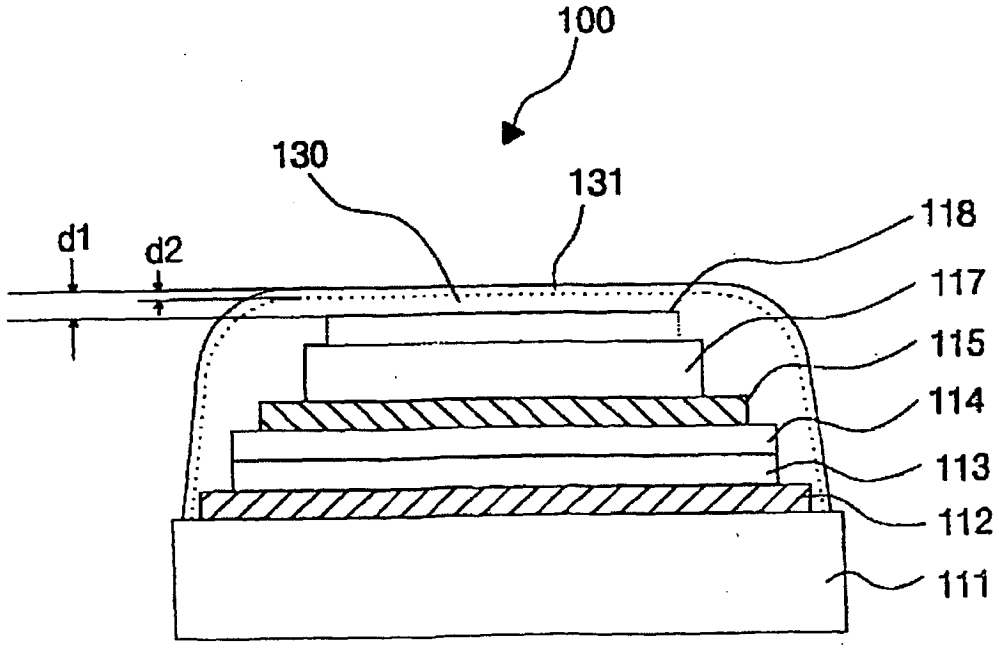

100
130
131
d1
d2
118
117
115
114
113
112
111

FIG. 3A

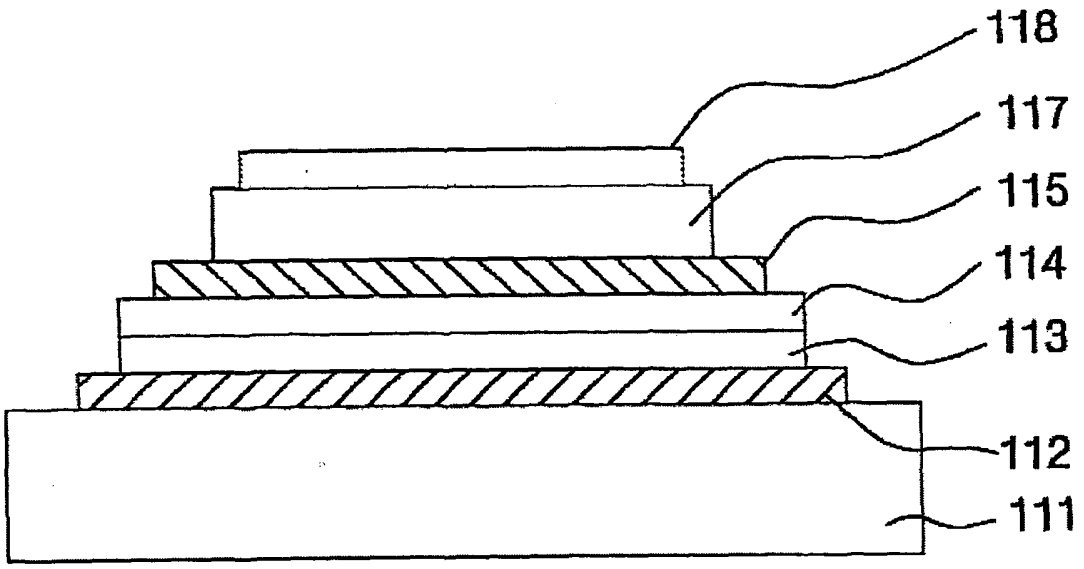

118
117
115
114
113
112
111

FIG. 3B

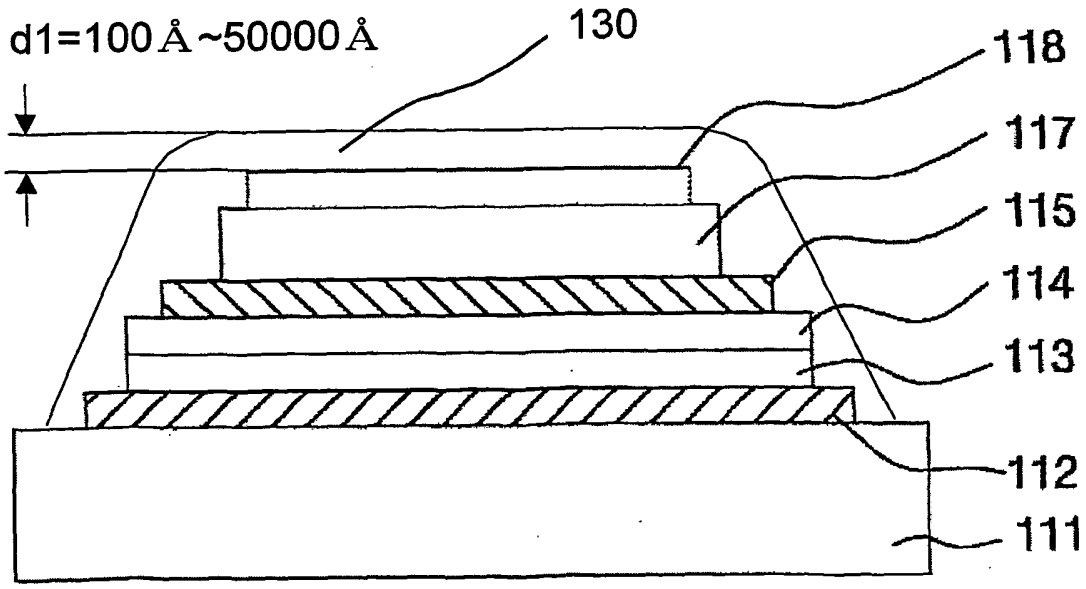

d1=100Å~50000Å
130
118
117
115
114
113
112
111

FIG. 3C

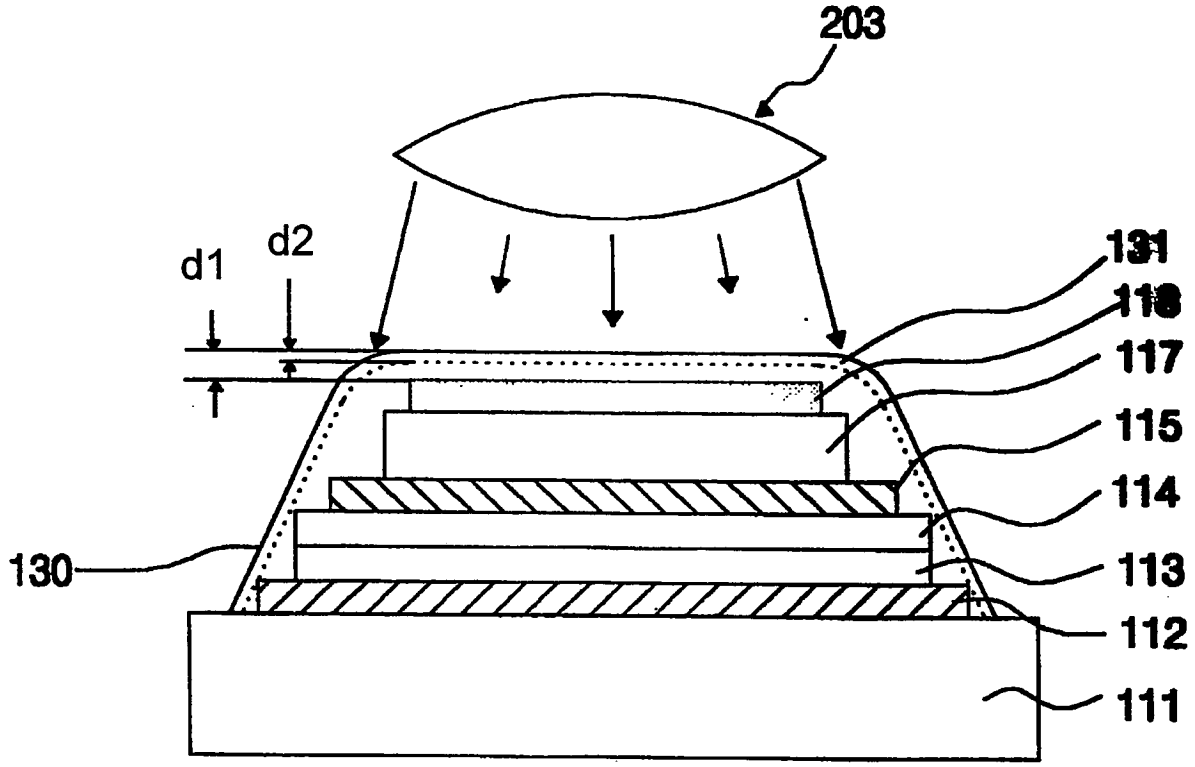


FIG. 4A

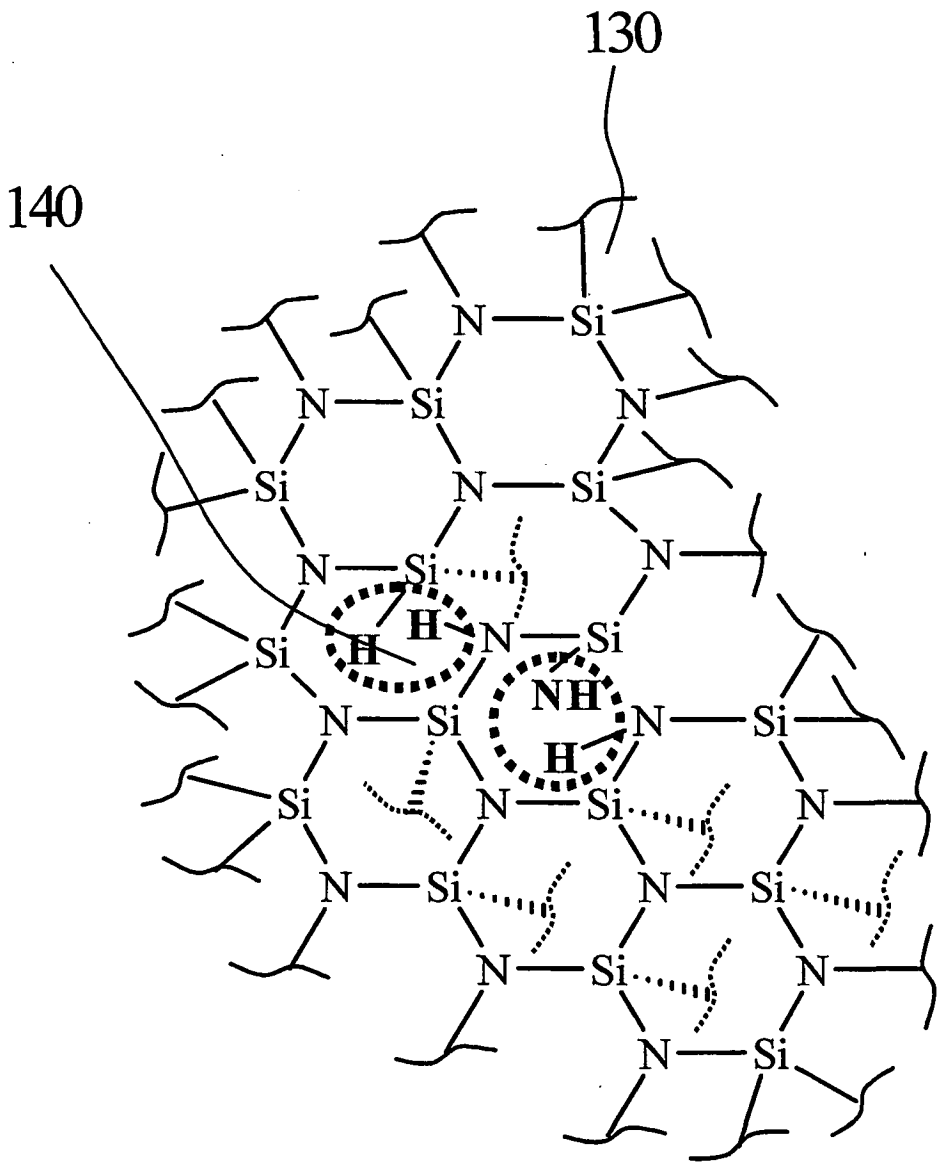
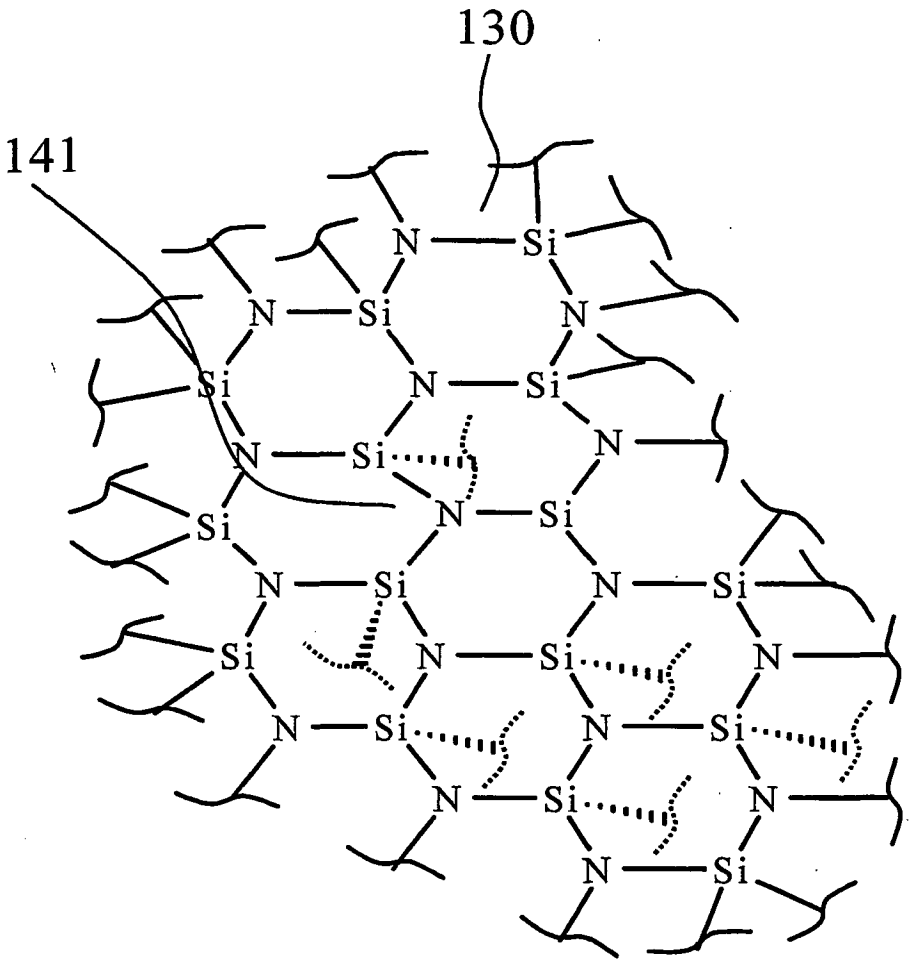


FIG. 4B



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 11121166 A **[0012]**
- WO 9801910 A **[0013]**
- EP 1021070 A **[0014]**

专利名称(译)	制造有机电致发光显示器的方法		
公开(公告)号	EP1410692B1	公开(公告)日	2012-05-23
申请号	EP2002738918	申请日	2002-06-14
[标]申请(专利权)人(译)	大宇电子服务股份有限公司		
申请(专利权)人(译)	CLD，INC.		
当前申请(专利权)人(译)	大宇电子服务有限公司		
[标]发明人	CHOI DO HYUN CHOI KYUNG HEE		
发明人	CHOI, DO-HYUN CHOI, KYUNG-HEE		
IPC分类号	H01L51/52 H05B33/04 H01L51/50 H05B33/10		
CPC分类号	H01L51/5259 H01L51/5253		
优先权	1020010049414 2001-08-16 KR 1020010034193 2001-06-16 KR 1020010057741 2001-09-18 KR		
其他公开文献	EP1410692A1 EP1410692A4		
外部链接	Espacenet		

摘要(译)

公开了一种制造有机电致发光显示器的方法，其能够通过在钝化层上局部执行准分子激光退火来提高器件特性和可靠性。本发明包括在透明基板上依次形成阳极层，有机电致发光层和阴极层，在包括阴极层的透明基板上形成钝化层，并对钝化层局部进行热处理。

FIG. 1

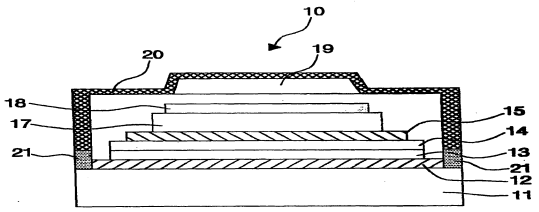


FIG. 2