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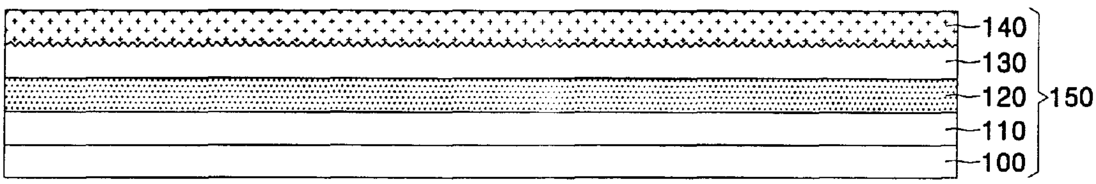
(54) Method of fabricating organic light emitting display

(57) A method of fabricating a donor substrate (150) for a laser induced thermal imaging (LITI) process. A base substrate is prepared (100). A light-to-heat conversion layer (120) is formed on the base substrate. A buffer layer (130) is formed on the light-to-heat conversion layer. The surface roughness of the buffer layer is increased by treating the surface of the buffer layer. A transfer layer (140) is formed on the surface-treated buffer layer. By using the donor substrate, a patterning process can be performed better during the fabrication of the OLED.

FIG. 1B



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Description

CLAIM OF PRIORITY

[0001] This application claims priority to and the benefit of Korean Patent Application No. 2004-68757, filed Aug. 30, 2004, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates to a method of fabricating an organic light emitting display (OLED) and, more particularly, to a method of fabricating an OLED using a donor substrate having a surface-treated buffer layer.

2. Description of the Related Art

[0003] Among flat panel displays (FPDs), an organic light emitting display (OLED) is quite appropriate for a medium that displays moving images irrespective of its sizes because the OLED has a fast response speed of 1 millisecond or less and a wide viewing angle, consumes low power, and is an emissive display. Also, the OLED can be fabricated at low temperature and in a simple process based on a conventional semiconductor manufacturing technology. For these reasons, the OLED has attracted much attention as the next-generation flat panel display (FPD).

[0004] The OLED can largely be classified into a polymer type using a wet process and a small-molecule type using a deposition process, according to the types of material and process used for an organic light emitting device. If an emission layer (EML) is formed of a small-molecule material, it is deposited in vacuum using a shadow mask. If the EML is formed of a polymer material, it is formed by an inkjet printing method. However, it is difficult to perform the vacuum deposition process using the shadow mask on a large-sized substrate. Also, since the inkjet printing method is a wet process, an underlying layer should be formed of only limited kinds of materials, and a bank structure should definitely be formed on a substrate.

[0005] As a substitute for the above-described methods of patterning the EML, a laser-induced thermal imaging (LITI) process has recently been developed.

[0006] During the LITI process, a pattern is formed by transferring a pattern forming material to a target substrate using laser beams irradiated from a light source. Such an LITI process requires a donor substrate on which a transfer layer is formed, a light source, and an acceptor substrate.

[0007] The donor substrate includes a base substrate, a light-to-heat conversion layer, and a transfer layer. During a transfer process using the donor substrate, laser beams are irradiated on a predetermined region of the base substrate and then converted into heat by the light-to-heat conversion layer. The heat transforms adhesion properties between the transfer layer and the light-to-heat conversion layer so that the transfer layer is transferred to the acceptor substrate.

[0008] Accordingly, the performance of the donor substrate depends on adhesion properties between the donor substrate and the transfer layer, and a poor adhesion between the transfer layer and the light-to-heat conversion layer may cause failures during the process of transferring the transfer layer to the acceptor substrate.

SUMMARY OF THE INVENTION

[0009] It is therefore an object of the present invention to solve aforementioned problems associated with conventional displays.

[0010] It is also an object of the present invention to provide a method of fabricating an organic light emitting display (OLED) using a donor substrate, in which adhesion properties between the donor substrate and the transfer layer are enhanced and a patterning process can be performed better during the fabrication of the OLED by interposing a buffer layer between a transfer layer and a light-to-heat conversion layer and then surface-treating the buffer layer.

[0011] It is still an object of the present invention to provide an improved method of transferring a pattern forming material to a target substrate.

[0012] According to an aspect of the present invention, a method of fabricating a donor substrate for a laser induced thermal imaging (LITI) process includes: preparing a base substrate of a donor substrate; forming a light-to-heat conversion layer on the base substrate; forming a buffer layer on the light-to-heat conversion layer; increasing the surface roughness of the buffer layer by treating the surface of the buffer layer; and forming a transfer layer on the surface-treated buffer layer.

[0013] According to an aspect of the present invention, a method of transferring a pattern forming material to a target substrate includes: preparing a donor substrate by a process comprising preparing a base substrate, forming a light-to-heat conversion layer on the base substrate, forming a buffer layer on the light-to-heat conversion layer, increasing surface roughness of the buffer layer, and forming a transfer layer on the surface-treated buffer layer; irradiating laser beams on a predetermined region of the donor substrate, the laser beams converted into heat by the light-to-heat conversion layer to transform adhesion properties between the transfer layer and the light-to-heat conversion layer; and transferring the transfer layer to the target substrate.

[0014] According to still an aspect of the present invention, a method of transferring a pattern forming material to a target substrate includes: preparing a donor substrate, the donor substrate constructed with a transfer layer, a light-to-heat conversion layer, and a surface-treated buffer layer interposed between the transfer layer and the light-to-heat conversion layer; irradiating laser beams on a predetermined region of the donor substrate, the laser beams converted into heat by the light-to-heat conversion layer to transform adhesion properties between the transfer layer and the light-to-heat conversion layer; and transferring the transfer layer to the target substrate.

[0015] The surface treatment of the buffer layer may be performed using oxygen ions or radical-based gases.

BRIEF DESCRIPTION OF THE DRAWINGS

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

[0017] Figs. 1A and 1B are cross-sectional views illustrating a method of fabricating a donor substrate for a laser induced thermal imaging (LITI) process according to an exemplary embodiment of the present invention;

[0018] Fig. 2A is a photograph of the surface after forming a buffer layer;

[0019] Fig. 2B is a photograph of the surface after surface-treating the buffer layer according to an exemplary embodiment of the present invention; and

[0020] Fig. 3 is a cross-sectional view illustrating the process of performing an LITI method on a unit pixel of an organic light emitting display (OLED) using the donor substrate.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. This invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure is thorough and complete and fully conveys the scope of the invention to those skilled in the art. The thicknesses of layers or regions shown in the drawings are exaggerated for clarity. The same reference numerals are used to denote the same elements throughout the specification.

[0022] Figs. 1A and 1 B are cross-sectional views illustrating a method of a donor substrate for a laser induced thermal imaging (LITI) process according to an exemplary embodiment of the present invention.

[0023] Referring to Fig. 1A, a base substrate 100 is prepared. The base substrate 100 may be a flexible substrate such as a plastic film, or a hard substrate such as a glass substrate.

[0024] A light-to-heat conversion layer 120 is formed on the base substrate 100.

[0025] Before the light-to-heat conversion layer 120 is formed, a primer layer 110 may be formed on the base substrate 100.

[0026] The primer layer 110 may be used to reinforce an adhesion between the base substrate 100 and the light-to-heat conversion layer 120. Also, the primer layer 110 may be used to treat the surface of the base substrate 100 and thus, assist in forming the light-to-heat conversion layer 120 with improved uniformity.

[0027] The light-to-heat conversion layer 120 is formed of a light absorption material that absorbs light in the infrared and visible regions. Also, the light-to-heat conversion layer 120 may be formed of an organic layer containing a material that absorbs laser beams, a metal layer, or a combination thereof.

[0028] The light-to-heat conversion layer 120 converts laser beams irradiated from a laser irradiating system into thermal energy. Then, the thermal energy transforms adhesion properties between the transfer layer 140 and the light-to-heat conversion layer 120. Thus, a region of the transfer layer 140 on which the laser beams are irradiated is transferred to a substrate as a subject, so that a patterning process is performed.

[0029] A buffer layer 130 is formed on the light-to-heat conversion layer 120. The buffer layer 130 prevents a transfer material from being damaged and effectively controls an adhesion between the transfer layer 140 and the donor substrate.

[0030] The buffer layer 130 may be formed of an organic or inorganic material, which is a polymer, a metal, or metal oxide.

[0031] The surface of the buffer layer 130 is treated to increase its surface roughness. In this case, the surface treatment of the buffer layer 130 may be performed, preferably using oxygen ions or radical-based gases 200.

[0032] Fig. 2A is a photograph of the surface after forming a buffer layer, and Fig. 2B is a photograph of the surface after surface-treating the buffer layer.

[0033] In comparison with Fig. 2A, Fig. 2B illustrates that after the buffer layer is surface-treated, the surface roughness of the buffer layer increases.

[0034] Accordingly, by treating the surface of the buffer layer 130 interposed between the transfer layer 140 and the light-to-heat conversion layer 120, adhesion properties between the donor substrate and the transfer layer 140 are enhanced.

[0035] Referring to Fig. 1B, the transfer layer 140 is formed on the surface-treated buffer layer 130.

[0036] The transfer layer 140 of the donor substrate may be an emission layer (EML) of the organic light emitting device.

[0037] In addition, the transfer layer 140 of the donor substrate may further include at least one selected from the group consisting of a hole injection layer, a hole transport layer, a hole blocking layer, and an electron injection layer.

[0038] Fig. 3 is a cross-sectional view illustrating a process of performing an LITI method on a unit pixel of an organic light emitting display (OLED) using the above-described donor substrate.

[0039] Referring to Fig. 3, a donor substrate 150, which is fabricated by the above-described method according to the present invention, is disposed over a substrate 210 on which a thin-film transistor (TFT) and a pixel electrode 290 are formed.

[0040] Specifically, the TFT including a semiconductor layer 230, a gate electrode 250, a source electrode 270a, and a drain electrode 270b is disposed on the substrate 210, and the pixel electrode 290 is connected to one of the source and drain electrodes 270a and 270b of the TFT and exposed by a pixel defining layer 295.

[0041] Once an LITI process 600 is performed on the donor substrate 150, a transfer layer 140a is transferred to the exposed portion of the pixel electrode 290 so that an EML is patterned.

[0042] After the patterning process is finished, an opposite electrode is formed, thereby completing the OLED.

[0043] In the exemplary embodiments of the present invention as described above, a donor substrate is fabricated by interposing a surface-treated buffer layer between a transfer layer and a light-to-heat conversion layer, so that adhesion properties between the transfer layer and the light-to-heat conversion layer can be enhanced.

[0044] Further, by using the above-described donor substrate, a patterning process can be performed better during the fabrication of the OLED.

[0045] Although the present invention has been described with reference to certain exemplary embodiments thereof, it will be understood by those skilled in the art that a variety of modifications and variations may be made to the present invention without departing from the spirit or scope of the present invention defined in the appended claims, and their equivalents.

Claims

1. A method of fabricating a donor substrate for a laser induced thermal imaging process, comprising:

preparing a base substrate;
forming a light-to-heat conversion layer on the base substrate;
forming a buffer layer on the light-to-heat conversion layer;
increasing surface roughness of the buffer layer; and
forming a transfer layer on the surface-treated buffer layer.

2. The method according to claim 1, wherein the step of increasing surface roughness of the buffer layer is performed using oxygen ions or radical-based gases.

3. The method according to claim 1, wherein the base substrate is one of a flexible film, a plastic film, a hard substrate and a glass substrate.

4. The method according to claim 1, wherein the transfer layer of the donor substrate is for an emission layer of an organic light emitting device.

5. The method according to claim 4, wherein the transfer layer of the donor substrate further includes at least one selected from a group consisting of a hole injection layer, a hole transport layer, a hole blocking layer, and an electron injection layer.

6. A method of transferring a pattern forming material to a target substrate, comprising:

preparing a donor substrate by a process comprising:

preparing a base substrate;
forming a light-to-heat conversion layer on the base substrate;
forming a buffer layer on the light-to-heat conversion layer;
increasing surface roughness of the buffer layer; and
forming a transfer layer on the surface-treated buffer layer;

irradiating laser beams on a predetermined region of the donor substrate, said laser beams converted into heat by the light-to-heat conversion layer to transform adhesion properties between the transfer layer and the light-to-heat conversion layer; and transferring the transfer layer to the target substrate.

7. The method according to claim 6, wherein the step of forming the donor substrate further comprises forming a primer layer on the base substrate, before forming the light-to-heat conversion layer.

8. The method according to claim 6, wherein the increasing of the roughness of the buffer layer is performed using oxygen ions or radical-based gases.

9. The method according to claim 6, wherein the target substrate is included in a unit pixel of an organic light emitting display.

10. The method according to claim 9, wherein the transfer layer of the donor substrate further includes at least one selected from a group consisting of a hole injection layer, a hole transport layer, a hole blocking layer, and an electron injection layer.

FIG. 1A

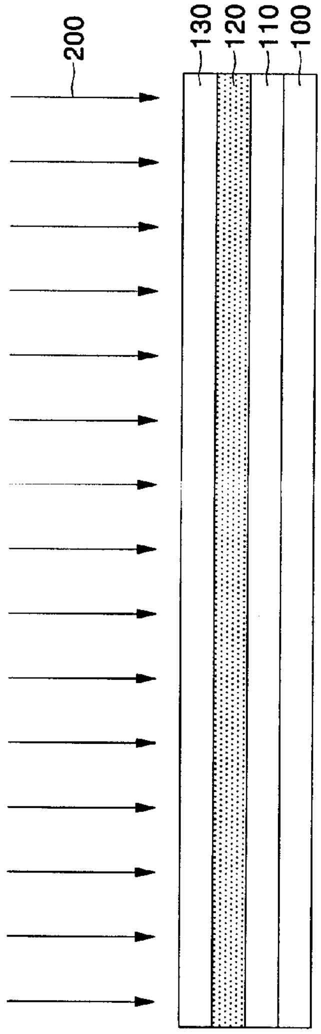


FIG. 1B

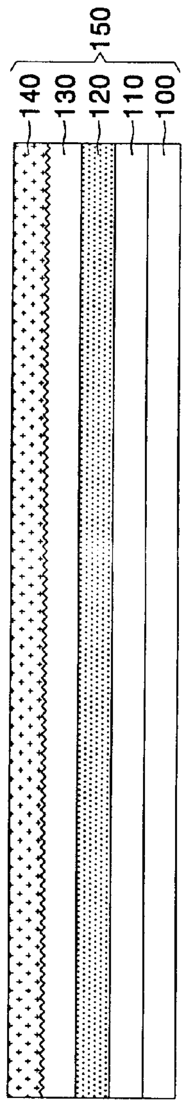


FIG. 2A

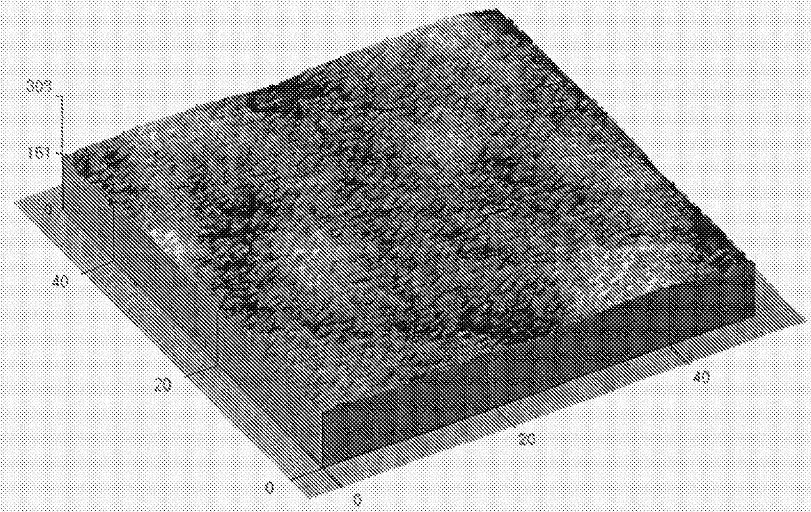


FIG. 2B

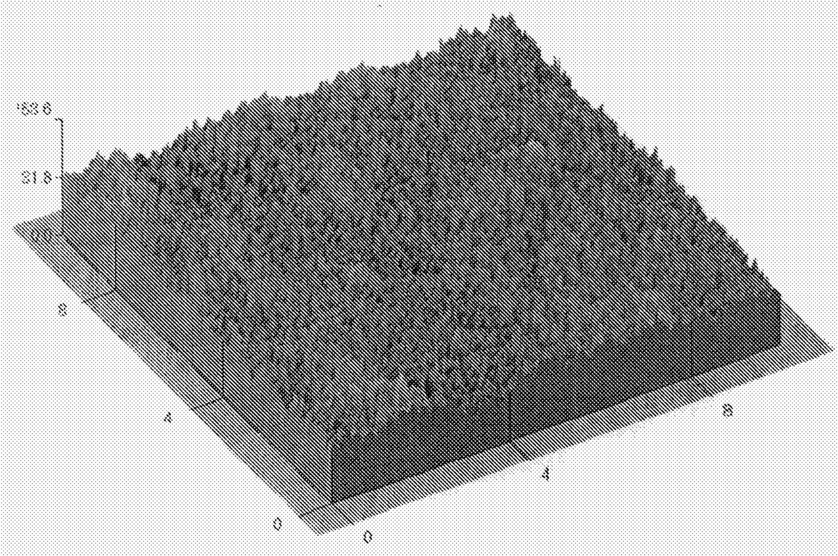
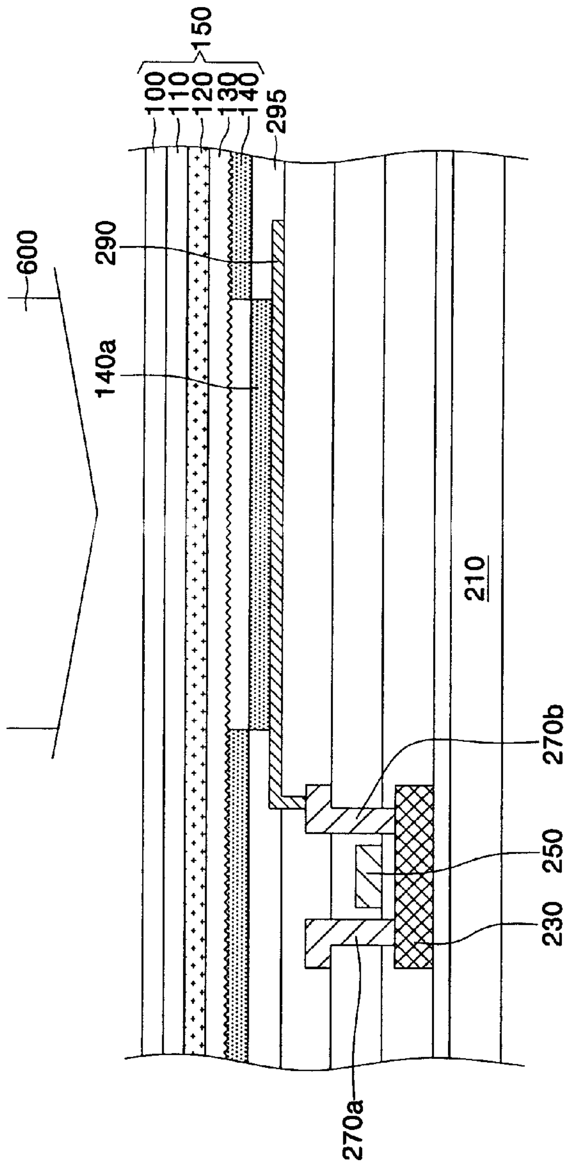


FIG. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 05 10 7828

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 2003/008224 A1 (FUJITA YOSHIMASA ET AL) 9 January 2003 (2003-01-09) * paragraphs [0010] - [0012], [0014], [0030], [0031], [0043], [0052], [0056], [0065], [0072], [0115]; figure 2b * -----	1-6,8-10 7	H01L27/00 H01L51/40
Y	WO 03/047872 A (3M INNOVATIVE PROPERTIES COMPANY) 12 June 2003 (2003-06-12) * page 12, line 16 - line 17; figure 2 * * page 13, line 14 - line 22 * -----	7	

TECHNICAL FIELDS SEARCHED (IPC)
H01L
B41M
H05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	2 November 2005	Bakos, T

3

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons
& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 05 10 7828

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02-11-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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WO 03047872 A	12-06-2003	AU 2002335842 A1	17-06-2003
		CN 1599669 A	23-03-2005
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		US 2003124265 A1	03-07-2003

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

专利名称(译)	制造有机发光显示器的方法		
公开(公告)号	EP1630868A1	公开(公告)日	2006-03-01
申请号	EP2005107828	申请日	2005-08-26
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IPC分类号	H01L27/00 H01L51/40		
CPC分类号	B41M5/42 B41M2205/12 B41M2205/38 H01L51/0013 H01L51/56		
代理机构(译)	hengelhaupt，Jürgen		
优先权	1020040068757 2004-08-30 KR		
外部链接	Espacenet		

摘要(译)

一种制造用于激光诱导热成像（LITI）过程的供体基底（150）的方法。制备基础衬底（100）。在基底基板上形成光热转换层（120）。在光热转换层上形成缓冲层（130）。通过处理缓冲层的表面来增加缓冲层的表面粗糙度。在表面处理的缓冲层上形成转移层（140）。通过使用施主衬底，可以在OLED的制造期间更好地执行图案化工艺。

FIG. 1B