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(54) LIQUID CRYSTAL DISPLAY DEVICE HAVING ORGANIC ALIGNMENT LAYER AND FABRICATION METHOD THEREOF

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(57) **ABSTRACT**

An alignment structure of a liquid crystal display device includes a substrate, a plurality of region defining strips disposed at intervals on the substrate, and organic alignment strips disposed between the region defining layers.

FIG. 1A

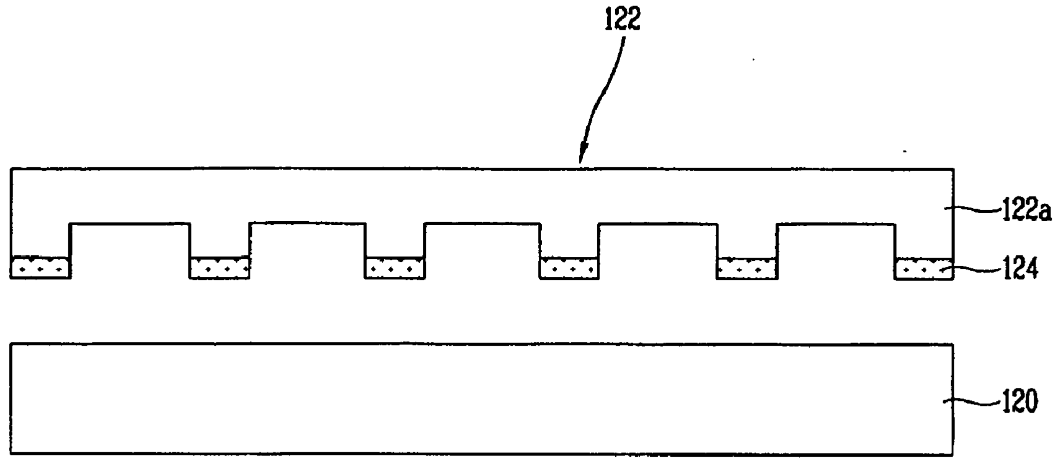


FIG. 1B

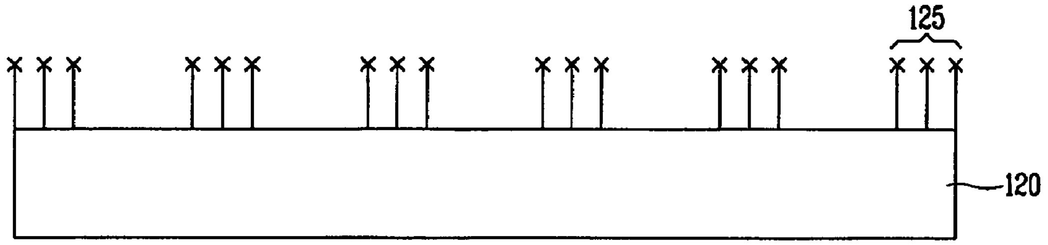


FIG. 1C

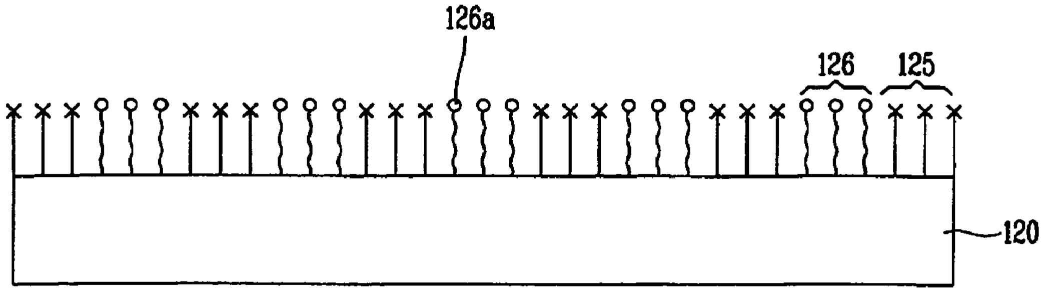


FIG. 2

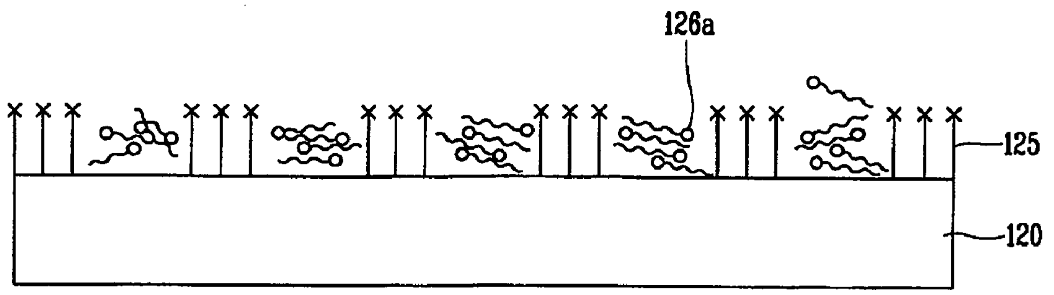
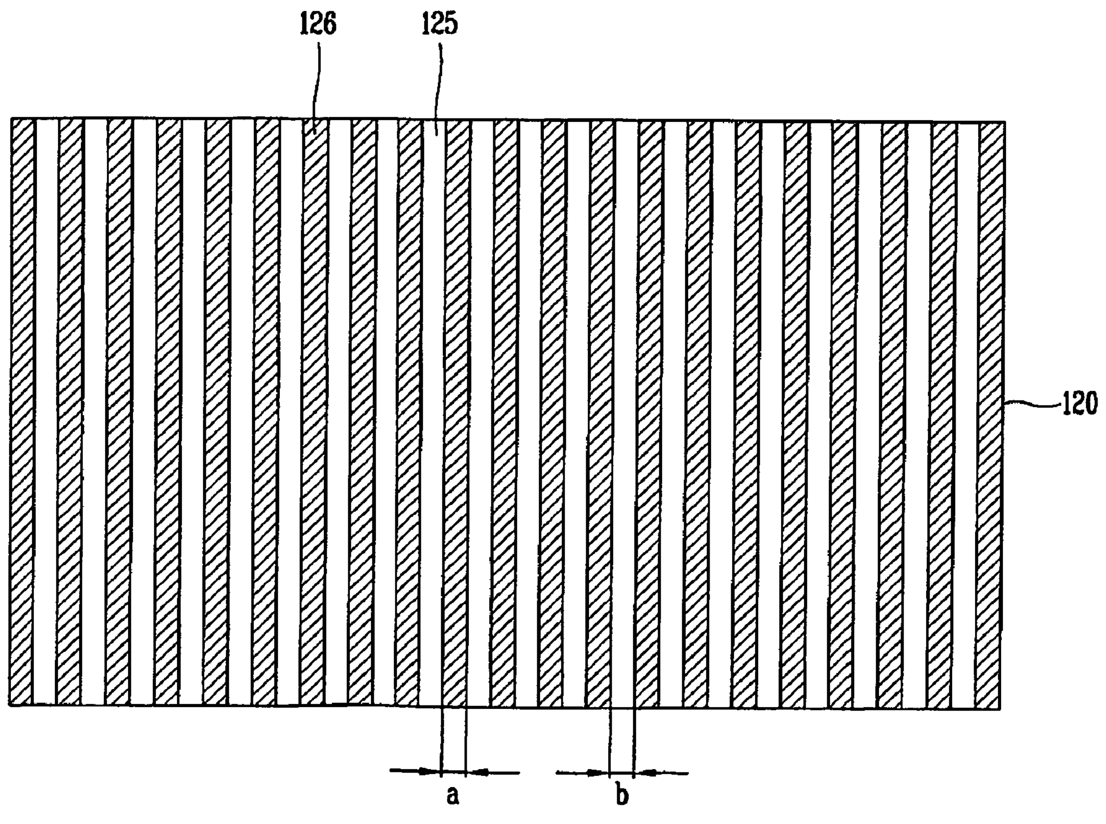


FIG. 3



LIQUID CRYSTAL DISPLAY DEVICE HAVING ORGANIC ALIGNMENT LAYER AND FABRICATION METHOD THEREOF

[0001] The present invention claims the benefit of Korean Patent Application No. 136172/2005 filed in Korea on Dec. 30, 2005, which is hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a display device, and more particularly, to an liquid crystal display (LCD) device and a fabrication method thereof. Although the present invention is suitable for a wide scope of applications, it is particularly suitable for an organic alignment layer for aligning liquid crystal molecules without rubbing.

[0004] 2. Description of the Related Art

[0005] In general, an LCD device is a display device for displaying images by controlling a transmittance of light through a liquid crystal layer by using refractivity anisotropy of liquid crystal molecules. In order to obtain uniform brightness and a high contrast ratio in the LCD device, an alignment must be performed so as to align the liquid crystal molecules in a predetermined direction. Currently, an alignment method by rubbing is commonly used. According to the alignment method by rubbing, an alignment film made of a material, such as polyimide, etc., is coated on a substrate, which is then rubbed by using a rubbing roll having an alignment cloth. Thus, uniform micro-grooves are formed on the surface of the alignment film. Liquid crystal molecules are arranged in parallel to the micro-grooves on the surface of the alignment film so as to minimize elastic deformation energy.

[0006] The related art alignment method by rubbing has a problem in that if the micro-grooves formed on the surface of the alignment film are defective, phase distortion and light scattering may occur, which undesirably degrades the performance of the LCD device. In addition, rubbing causes the generation of dust and static electricity on the alignment film, which undesirably degrades a production yield and damages the substrate. Moreover, for a large-sized LCD device built on a large substrate, a large-scale heavy rubbing roll must be used for rubbing the corresponding large substrate, and in such case, it is quite difficult to perform proper rubbing on the entire surface of the substrate with the rubbing roll applying a uniform pressure.

SUMMARY OF THE INVENTION

[0007] Accordingly, the present invention is directed to an LCD device and a fabrication method thereof that substantially obviate one or more of the problems due to limitations and disadvantages of the related art.

[0008] An object of the present invention is to provide an alignment film for an LCD device without performing a rubbing process.

[0009] Another object of the present invention is to provide a self-arranging organic alignment film for an LCD device.

[0010] 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.

[0011] To achieve these and other advantages and in accordance with the present invention, as embodied and broadly described herein, there is provided a method for fabricating an alignment film includes: providing a substrate; forming a plurality of region defining strips at an interval on the substrate; and forming organic alignment strips for aligning liquid crystal molecules between the region defining strips by applying an organic alignment material on the substrate.

[0012] In another aspect, an alignment structure of a liquid crystal display device includes a substrate, a plurality of region defining strips disposed at intervals on the substrate, and organic alignment strips disposed between the region defining layers.

[0013] In another aspect, a method for fabricating a liquid crystal display device includes: providing first and second substrates; forming a plurality of region defining strips at an interval on the first and second substrates; forming organic alignment strips between the region defining strips by applying an organic alignment material on the first and second substrates; and forming a liquid crystal panel by attaching the first and second substrates.

[0014] In yet another aspect, a liquid crystal display device includes: first and second substrates; a plurality of region defining strips disposed at intervals on the substrates; organic alignment strips disposed between the region defining strips; and a liquid crystal layer formed between the first and second substrates.

[0015] The foregoing and other features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] 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.

[0017] FIGS. **1**A to **1**C show sequential processes of an exemplary method for forming organic alignment strips in accordance with an embodiment of the present invention.

[0018] FIG. **2** is a view of an arrangement of organic alignment molecules in a wide organic alignment layer.

[0019] FIG. **3** is a plan view of a substrate with the organic alignment strips coated thereon in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

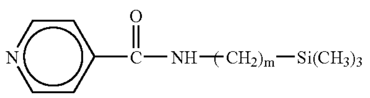
[0021] Embodiments of the present invention provides an alignment film for aligning liquid crystal molecules in a predetermined direction without performing rubbing, and a method for fabricating the alignment film. More particularly, liquid crystal molecules are aligned according to chemical characteristics of the alignment film, rather than being aligned by morphological micro-grooves formed on the alignment film through a rubbing process. The alignment film is made of an organic material. When the organic alignment film material is coated on the substrate, a top of the chain in the organic material chemically interact with the liquid crystal molecules, and thus the liquid crystal molecules are aligned along the tops of the chains. Accordingly, to align the liquid crystal molecules in a desired direction, the tops of the chains in the organic alignment material need to be arranged in a desired direction.

[0022] To arrange the tops of the chains in the organic alignment material in a desired direction, a region defining material is first coated to define regions of the organic alignment film. The arrangement of the chains in the organic alignment material, which interact with the liquid crystal molecules, is determined depending on the size of the regions coated by the organic alignment material. The region defining material and an organic alignment layer are alternately formed on the substrate as strips extending in an alignment direction to thereby arrange the organic alignment material in the alignment direction and to align the liquid crystal molecules in the alignment direction.

[0023] The region defining material and the organic alignment material have opposite hydroscopic characteristics. More particularly, the region defining material is hydrophilic while the organic alignment material is hydrophobic. Thus, they are self-assembled monolayer materials that form strips with a pre-set width by themselves as a result of repulsing each other when the organic alignment material is subsequently provided on the region defining material.

[0024] The organic alignment material in embodiments of the present invention can be N-(3-(trimethylsilyl)propyl-)isonicotinamide whose chemical formula is as follows:

[Chemical formula 1]



wherein 'm' is 1~30. In the organic alignment material, the pyridine group at the top of the chains interact with liquid crystal molecules for alignment thereof. In other words, the liquid crystal molecules are aligned along the alignment direction of the pyridine group at the tops of the organic chain.

[0025] The organic alignment material also contains a hydrophobic group, such as a trimethylsil group, that is used to form the organic alignment film as a series of alignment strips on the substrate in a self-arranged manner. The alignment film of the LCD device and its fabrication method in accordance with the present invention will now be described in more detail with reference to the accompanying drawings.

[0026] FIGS. **1**A to **1**C show sequential processes of an exemplary method for forming an organic alignment film in accordance with an embodiment of the present invention. The method for forming the organic alignment film, will be described in more detail with reference to FIGS. **1**A to **1**C. As shown in FIG. **1**, a region defining material **124** is coated on convex portions **122***a*, which are at regular intervals, of a mold **122**. One of the convex portions **122***a* of the mold **122** has the width of about 1~20 nm, and is spaced apart from an adjacent one of the concave portions **122***a* by about 1~20 nm.

[0027] A n-mercaptopentadecanoic acid can be used as the region defining material **124**. The n-mercaptopentadecanoic acid includes a mercapto group and carboxyl group. The carboxyl group has a hydrophilic property, as shown in the following chemical formula:

$$HOOC\text{-}(CH_2)_n\text{—}SH \qquad \text{[Chemical formula 2]}$$

wherein 'n' is 1~30.

[0028] As shown in FIG. **1**B, when the convex portions **122***a* of the mold coated with the region defining material **124** contacts the substrate **120**, which can be made of glass, the region defining material **124** is transferred onto the substrate **120** to form region defining strips **125** on the substrate **124**. Such a deposition method using the mold **122** having the micro-convex portions is called a micro-contact printing process. Since the convex portion **122** has a width of about 1~20 nm, the region defining strips **125** formed on the substrate **120** also have a width of about 1~20 mm. The n-mercaptopentadecanoic acid for forming the region defining layer **125** is coated such that carboxyl group with hydrophilic characteristics at the top surface.

[0029] Subsequently, as shown in FIG. **1**C, when the organic alignment material, such as ((trimethylsilyl)propyl)isonicotinamide is applied on the substrate **120**, the hydrophobic trimethylsilyl group of the ((trimethylsilyl)propyl-)isonicotinamide and the hydrophilic carboxyl group of the n-mercaptopentadecanoic acid repulse each other, causing the organic alignment strips **126** to be formed only between the region defining strips **125**. The substrate **120** can be either showered with ((trimethylsilyl)propyl)isonicotinamide or submerged in ((trimethylsilyl)propyl)isonicotinamide) to form the organic alignment strips **126** only between the region defining strips **125**

[0030] The region defining strips **125** are provided at an interval of about 1~10 nm on the substrate **120**. Thus, the organic alignment strips **126** between the region defining strips **125** also have a width of about 1~10 nm. Accordingly, the organic alignment strips **126** are positioned between the region defining strips **125** because of the hydrophilic characteristic of the region defining strips and hydrophobic characteristic of the organic alignment material. Thus, the organic alignment strips **126** self-arrange themselves between the region defining strips **125**. The ((trimethylsilyl)propyl)isonicotinamide together with and n-mercaptopentadecanoic acid can be considered a self-assembled mono layer (SAM) material. In other words, n-mercaptopentadecanoic acid can be called a primary SAM material and ((trimethylsilyl)propyl)isonicotinamide can be called a secondary SAM material.

[0031] The ((trimethylsilyl)propyl)isonicotinamide molecules positioned between the region defining strips **125** includes a propyl group at one end of the ((trimethylsilyl-)propyl)isonicotinamide molecules adjacent to the substrate

120 and a pyridine group positioned at the other end of the ((trimethylsilyl)propyl)isonicotinamide molecules adjacent to the top surface of the organic alignment layer. The liquid crystal molecules interact with the pyridine groups so as to align themselves in the same direction as the organic alignment strips **126** are arranged between the region defining strips **125**. In other words, the pyridine groups in the organic alignment strips **126** align the liquid crystal molecules. As shown in FIG. **1**C, the molecules of ((trimethylsilyl)propyl)isonicotinamide positioned between the region defining strips **125** are arranged such that the pyridine groups **126***a* at one end of the ((trimethylsilyl)propyl)isonicotinamide molecules are at a top surface of the organic alignment strips **126** and the other end of the ((trimethylsilyl)propyl)isonicotinamide molecules are adjacent to the substrate **120**.

[0032] When ((trimethylsilyl)propyl)isonicotinamide is positioned between the region defining strips **125**, the ((trimethylsilyl)propyl)isonicotinamide molecules are arranged in a stable energy state such that propyl group is positioned at one end of the ((trimethylsilyl)propyl)isonicotinamide molecule and pyridine group is positioned at the other end of the ((trimethylsilyl)propyl)isonicotinamide molecule. However, an ((trimethylsilyl)propyl)isonicotinamide molecule can interact with adjacent ((trimethylsilyl)propyl-)isonicotinamide molecules. These interactions can cause non-uniform arrangements of ((trimethylsilyl)propyl)isonicotinamide molecules at unstabilized energy states. The amount or degree of such interactions depend on the width of the coated organic alignment strips **126**. Thus, the arrangement state or alignment mechanism capability of the ((trimethylsilyl)propyl)isonicotinamide molecules depends on the width of the organic alignment strips **126**.

[0033] FIG. **2** is a view of an arrangement of organic alignment molecules in a wide organic alignment layer. As shown in FIG. **2**, if the interval between the region defining strips **125** or the width of the organic alignment strips **126** is too wide, the ((trimethylsilyl)propyl)isonicotinamide molecules will lie on their sides or be irregularly distributed in a destabilized energy state. Since the pyridine groups of the ((trimethylsilyl)propyl)isonicotinamide molecules are not at the top surface of organic alignment layer, the liquid crystal molecules will interact with the pyridine groups of the ((trimethylsilyl)propyl)isonicotinamide molecules and thus not align the liquid crystal molecules along the organic alignment strips **126**.

[0034] In embodiments of the present invention, the interval between the region defining strips **125** is 1~20 nm such that the ((trimethylsilyl)propyl)isonicotinamide molecules are arranged at a stabilized energy state, and pyridine groups **126***a* at one end of the ((trimethylsilyl)propyl)isonicotinamide molecules are at the top surface of the organic alignment strips **126** and the other end of the ((trimethylsilyl)propyl)isonicotinamide molecules are adjacent to the substrate **120**. Accordingly, since the pyridine groups are arranged at the top surface of the organic alignment strips **126**, the liquid crystal molecules can interact with the pyridine groups so as to be aligned in the same direction as the region defining strips **125** are arranged.

[0035] FIG. **3** is a plan view of a substrate with the organic alignment strips coated thereon in accordance with an embodiment of the present invention. As shown in FIG. **3**, the region defining strips **125** and the organic alignment layers **126** are formed on the substrate **120**. As shown in FIG. **3**, the region defining strips **125** of n-mercaptopentadecanoic acid and the organic alignment strips **126** of ((trimethylsilyl)propyl)isonicotinamid are alternately formed on the substrate **120**, and their widths ('a' and 'b') are about 1~20 nm, respectively. The direction of the region defining layers **125** and the organic alignment strips **126** is the alignment direction for the liquid crystal molecules. By changing the direction of the region defining layers **125** and the organic alignment strips **126**, the alignment direction of liquid crystal molecules can be changed.

[0036] The substrate **120** can be a thin film transistor (TFT) substrate with a driving element array, such as an array of TFTs, formed thereon or a color filter substrate with a color filter layer formed thereon. Although not shown, a TFT substrate includes a plurality of gate lines and a plurality of data lines defining pixels therebetween. A TFT a pixel electrode is formed in each pixel, so that when the TFT is turned on, an image signal is applied to the pixel electrode. A color filter layer for implementing colors to be actually displayed can be formed on the color filter substrate.

[0037] Organic alignment strips **126** can be formed on one of or both the TFT substrate and on the color filter substrate. The TFT substrate and the color filter substrate are attached with a liquid crystal layer therebetween such that the LCD device is fabricated. After the TFT substrate and the color filer substrate are attached and then divided into unit liquid crystal panels, liquid crystals can be injected into the unit liquid crystal panel to form the liquid crystal layer. Alternatively, liquid crystal materials can be dropped onto at least one of the TFT substrate and the color filter substrate having a plurality of liquid crystal panels formed, and then, the two substrates are attached to make the liquid crystals spread between the TFT substrate and the color filter substrate, which are then divided into unit liquid crystal panels.

[0038] The alignment direction of organic alignment strips **126** on one of the substrates can be perpendicular or parallel with the organic alignment strips **126** on the other of the substrates. each other on the TFT substrate or the color filter substrate. The liquid crystal molecules can be aligned in the same direction as the orientation of the organic alignment layers between the region defining strips **125**. In this respect, the arrangement direction of the organic alignment material is not defined by itself, but rather by the region defining strips **125**. Thus, although the organic alignment material aligns the liquid crystal molecules interacting with them, in order to arrange the organic alignment material in the predetermined direction (namely, in the upward direction), the region defining material is also required. That is, since the region defining material substantially helps to align the liquid crystal molecules, it can be considered as an auxiliary alignment material for aligning the liquid crystal molecules. From this point of view, the n-mercaptopentadecanoic acid can be regarded as a primary alignment material while (trimethylsilyl)propyl)isonicotinamide can be regarded as a secondary alignment material.

[0039] Providing the region defining material and the organic alignment material as the SAM on the substrate is due to the hydrophilic group of the region defining material and the hydrophobic group of the organic alignment material. The hydrophilic group and hydrophobic group serve only to form the organic alignment strips as the SAM on the substrate, without affecting the alignment of the liquid crystal molecules. Thus, any organic compound can be applied in embodiments of the present invention so long as it has the region defining material containing a hydrophobic group and the organic alignment material containing a hydrophilic group.

[0040] In addition, the region determining material and the organic alignment material specified as particular materials in the above-described embodiment are merely examples for explaining an embodiment of the present invention. Any organic compound containing the chains that can interact with the liquid crystal molecules and a hydrophilic group (or hydrophobic group) can be used as the organic alignment material, and also, any organic compound containing the hydrophobic group (or hydrophilic group) that repulses the hydrophilic group (or hydrophobic group) of the organic alignment material can be used as the region defining material.

[0041] As so far described, the LCD device having the organic alignment layer and its fabrication method in accordance with the present invention have at least the following advantages. The organic alignment material containing the chains for aligning liquid crystal molecules in the predetermined direction by a interaction with them is simply coated onto the substrate by using a region defining material, and thus a rubbing process does not need to be performed. Therefore, a phase distortion and light spreading that may be generated during the rubbing process can be minimized or prevented. Also, since dust or static electricity is not generated on the alignment film, degradation of a production yield or damage of the substrate can be minimized or prevented. In addition, when large-scale substrates are processed for alignment, the uniform alignment anchoring force or surface affixing force can be sufficiently provided by the alignment strips on the liquid crystal molecules.

[0042] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A method for fabricating an alignment film, comprising:

providing a substrate;

forming a plurality of region defining strips at an interval on the substrate; and

forming organic alignment strips for aligning liquid crystal molecules between the region defining strips by applying an organic alignment material on the substrate.

2. The method of claim 1, wherein the forming the region defining strips includes:

preparing a mold having convex portions;

coating a region defining material on the convex portions; and

contacting the mold with the substrate and transferring the region defining material onto the substrate.

3. The method of claim 1, wherein the forming the organic alignment strips includes:

showering the substrate with the organic alignment material.

4. The method of claim 1, wherein the forming the organic alignment strips include:

submerging the substrate in the organic alignment material.

5. The method of claim 1, wherein a region defining material of the region defining strips includes a hydrophilic group and the organic alignment material includes a hydrophobic group and an alignment group.

6. The method of claim 5, wherein the hydrophilic group is a carboxyl group, the hydrophobic group is a trimethylsil group and the alignment group includes a pyridine group.

7. The method of claim 6, wherein the region defining material is n-mercaptopentadecanoic acid (15-mercaptopentadecanoic acid) and the organic alignment material is N-(3-(trimethylsilyl)propyl)isonicotinamide.

8. The method of claim 1, wherein a region defining material of the region defining strips includes a hydrophobic group and the organic alignment material includes a hydrophilic group.

9. The method of claim 5 or 8, wherein as the hydrophobic group and the hydrophilic group repulse each other, the organic alignment material is positioned between the region defining strips.

10. The method of claim 1, wherein the organic alignment material positioned between the region defining strips is arranged at a stabilized energy state.

11. The method of claim 1, wherein a width of one of the organic alignment strips is about 1~20 nm.

12. The method of claim 11, wherein a width of one of the region defining strips is about 1~20 nm.

13. The method of claim 11, wherein a first group at an end of a chain of the organic alignment material adjacent to the substrate is hydrophobic and a second group at an other end of the chain of the organic alignment material is an alignment group for aligning liquid crystal.

14. The method of claim 13, wherein the chain of the organic alignment material is substantially perpendicular to the substrate such that the alignment group is at a top surface of the organic alignment strips.

15. An alignment structure of a liquid crystal display device, comprising:

a substrate;

a plurality of region defining strips disposed at intervals on the substrate; and

organic alignment strips disposed between the region defining strips.

16. The structure of claim 15, wherein a region defining material of the region defining strips includes a hydrophilic group and the organic alignment material includes a hydrophobic group and an alignment group.

17. The structure of claim 15, wherein the hydrophilic group is a carboxyl group and the hydrophobic group is a trimethylsil group, and the alignment group is a pyridine group.

18. The structure of claim 17, wherein the region defining material is n-mercaptopentadecanoic acid (15-mercaptopentadecanoic acid), and the organic alignment material is N-(3-(trimethylsilyl)propyl)isonicotinamide.

19. The structure of claim 15, wherein a region defining material of the region defining strips includes a hydrophobic group, and the organic alignment material includes a hydrophilic group and an alignment group.

20. The structure of claim 15, wherein the organic alignment material coated between the region defining strips is in a stable energy state.

21. The structure of claim 15, wherein a width of one of the organic alignment strips is about 1~20 nm.

22. The structure of claim 21, wherein a width of one of the region defining layers is about 1~20 nm.

23. The structure of claim 21, wherein a first group at an end of a chain of the organic alignment material adjacent to the substrate is hydrophobic and a second group at an other end of the chain of the organic alignment material is an alignment group for aligning liquid crystal.

24. The method of claim 23, wherein the chain of the organic alignment material is substantially perpendicular to the substrate such that the alignment group is at a top surface of the organic alignment strips.

25. A method for fabricating a liquid crystal display device, comprising:

providing first and second substrates;

forming a plurality of region defining strips at an interval on the first and second substrates;

forming organic alignment strips between the region defining strips by applying an organic alignment material on the first and second substrates; and

forming a liquid crystal panel by attaching the first and second substrates.

26. The method of claim 25, wherein the forming the region determining layer includes:

preparing a mold having a plurality of convex portions;

coating a region defining material on the convex portions; and

contacting the mold with the first and second substrates and transferring the region defining material onto the first and second substrates.

27. The method of claim 25, wherein a region defining material of the region defining strips includes a hydrophilic group and the organic alignment material includes a hydrophobic group and an alignment group.

28. The method of claim 27, wherein the hydrophilic group is a carboxyl group, the hydrophobic group is a trimethylsil group and the alignment group is a pyridine group.

29. The method of claim 28, wherein the region defining material is n-mercaptopentadecanoic acid (15-mercaptopentadecanoic acid) and the organic alignment material is N-(3-(trimethylsilyl)propyl)isonicotinamide.

30. The method of claim 25, wherein the region defining material of the region defining layer includes a hydrophobic group and the organic alignment material includes a hydrophilic group and an alignment group.

31. The method of claim 27 or 29, wherein as the hydrophobic group and the hydrophilic group repulse each other, the organic alignment material is positioned between the region defining strips.

32. The method of claim 25, wherein the organic alignment material positioned between the region defining strips is in a stable energy state.

33. The method of claim 25, wherein a width of the organic alignment strips is about 1~20 nm.

34. The method of claim 33, wherein a width of the region defining layer is about 1~20 nm.

35. The method of claim 33, wherein a first group at an end of a chain of the organic alignment material adjacent to the substrate is hydrophobic and a second group at an other end of the chain of the organic alignment material is an alignment group for aligning liquid crystal.

36. The method of claim 35, wherein the chain of the organic alignment material is substantially perpendicular to the substrate such that the alignment group is at a top surface of the organic alignment strips.

37. The method of claim 25, wherein the first and second substrates are a thin film transistor substrate on which a thin film transistor is formed and a color filter substrate on which a color filter layer is formed.

38. The method of claim 25, wherein the forming the liquid crystal panel includes:

attaching the first and second substrates;

dividing the first and second substrates into unit liquid crystal panels; and

forming a liquid crystal layer on the divided unit liquid crystal panels.

39. The method of claim 25, wherein the forming the liquid crystal panel includes:

dropping liquid crystal material on at least one of the first and second substrates;

attaching the first and second substrates; and

dividing the first and second substrates into unit liquid crystal panels.

40. A liquid crystal display device, comprising:

first and second substrates;

a plurality of region defining strips disposed at intervals on the substrates;

organic alignment strips disposed between the region defining strips; and

a liquid crystal layer formed between the first and second substrates.

41. The device of claim 40, wherein a region defining material of the region defining strips includes a hydrophilic group and the organic alignment material includes a hydrophobic group and an alignment group.

42. The device of claim 41, wherein the hydrophilic group is a carboxyl group, the hydrophobic group is a trimethylsil group and the alignment group is a pyridine group.

43. The device of claim 42, wherein the region defining material is n-mercaptopentadecanoic acid (15-mercaptopentadecanoic acid) and the organic alignment material is N-(3-(trimethylsilyl)propyl)isonicotinamide.

44. The device of claim 40, wherein a region defining material of the region defining layer includes a hydrophobic group and the organic alignment material includes a hydrophilic group and an alignment group.

45. The device of claim 40, wherein the organic alignment material positioned between the region defining strips is in a stable energy state.

46. The device of claim 40, wherein a width of the organic alignment strips is about 1~20 nm.

47. The device of claim 46, wherein a width of the region defining layer is about 1~20 nm.

48. The device of claim 46, wherein a first group at an end of a chain of the organic alignment material adjacent to the substrate is hydrophobic and a second group at an other end of the chain of the organic alignment material is an alignment group for aligning liquid crystal.

49. The device of claim 48, wherein the chain of the organic alignment material is substantially perpendicular to the substrate such that the alignment group is at a top surface of the organic alignment strips.

50. A method for fabricating a liquid crystal display device, comprising:

providing a substrate;

forming an alignment layer on the substrate, the alignment layer includes:

a plurality of first regions for aligning liquid crystal molecules in a desired direction and second regions between the first regions to arrange alignment groups of the alignment layer.

* * * * *

专利名称(译)	具有有机取向层的液晶显示装置及其制造方法		
公开(公告)号	US20070154655A1	公开(公告)日	2007-07-05
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优先权	1020050136172 2005-12-30 KR		
其他公开文献	US7755731		
外部链接	Espacenet USPTO		

摘要(译)

液晶显示装置的对准结构包括基板，在基板上间隔设置的多个区域限定条带，以及设置在区域限定层之间的有机对准条带。

[Chemical formula 1]