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(54) **LIQUID CRYSTAL DISPLAY PANEL AND METHOD FOR MANUFACTURING THE SAME**

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(57) **ABSTRACT**

A liquid crystal display panel and a method for manufacturing the same. The liquid crystal display panel includes lower substrate having a first substrate; an upper substrate having a second substrate that is opposite to the first substrate; a liquid crystal layer is disposed between the lower and upper substrates such that liquid crystals are arranged in a first region between the first substrate and the second substrate; and a dam pattern arranged in a second region which surrounds a circumference of the first region as a region between the first substrate and the second substrate, the dam pattern having both a physical barrier function and a chemical barrier function.

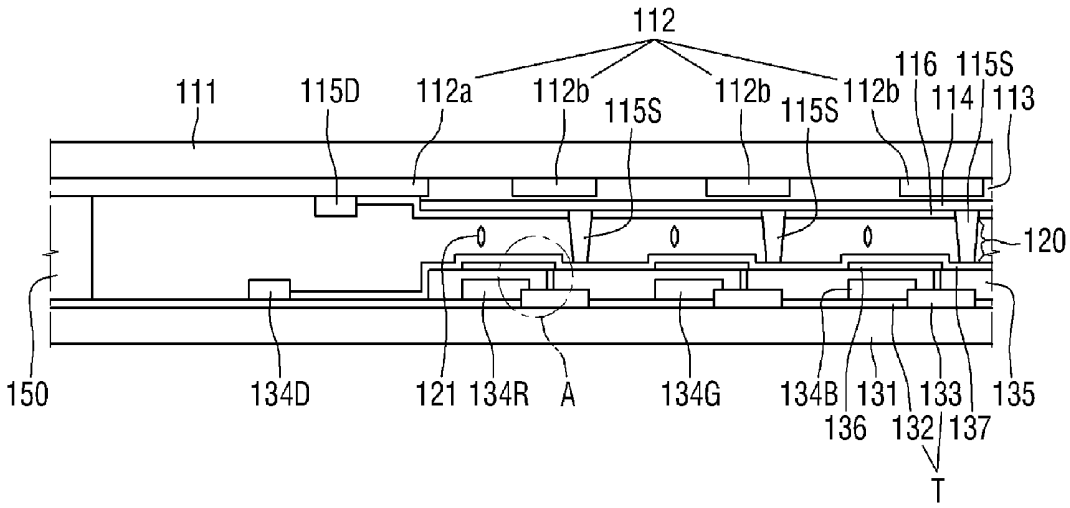
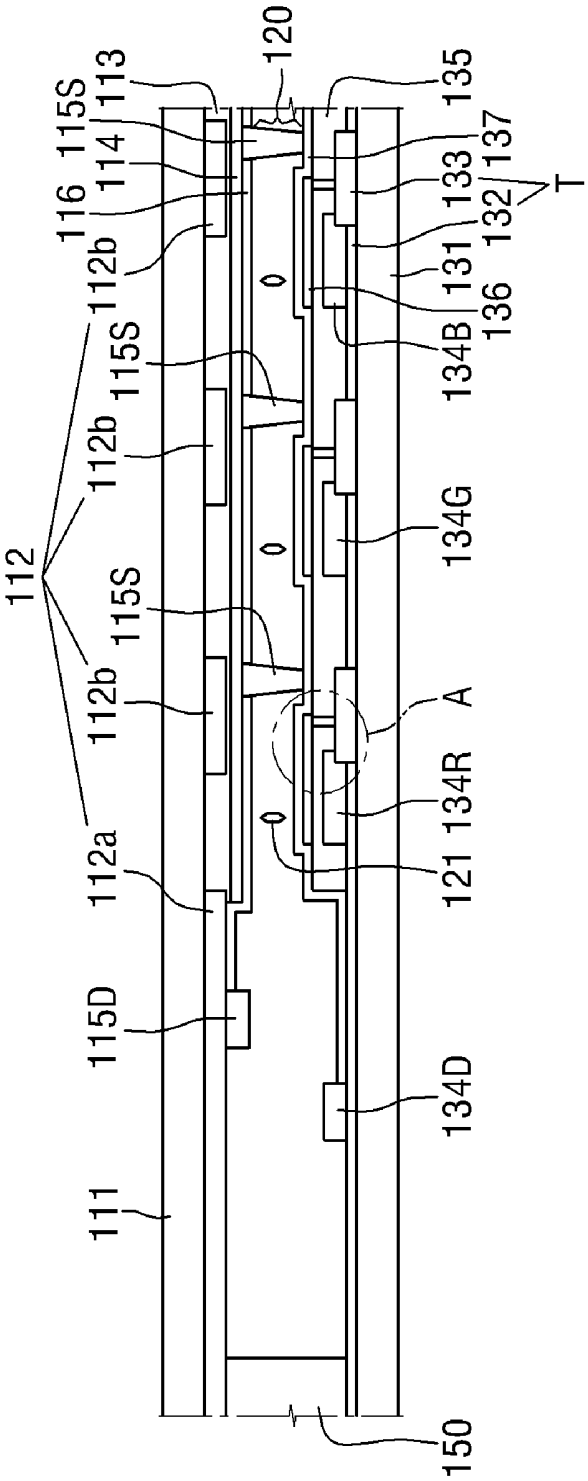


FIG. 1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134R
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111
150

FIG.2

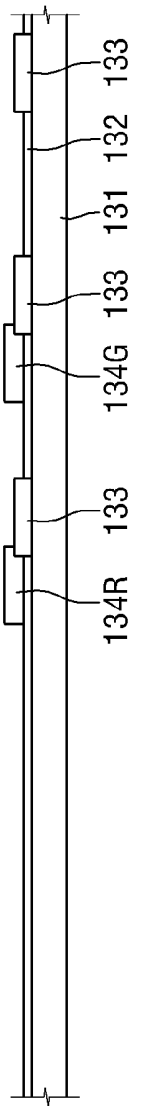

FIG.3

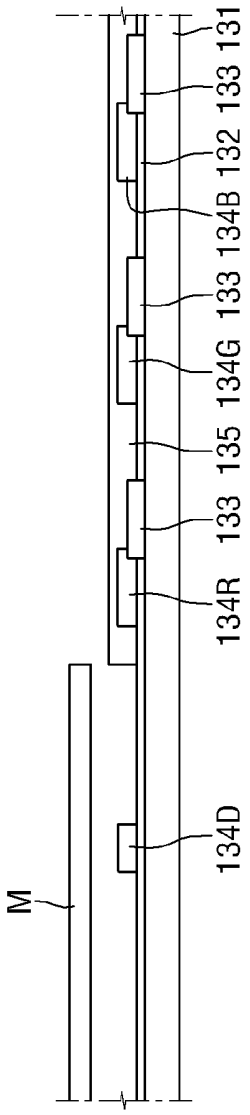

FIG.4

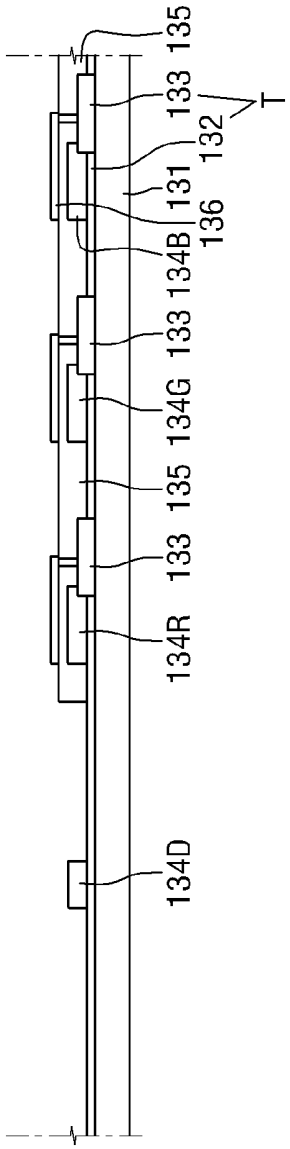

FIG.5

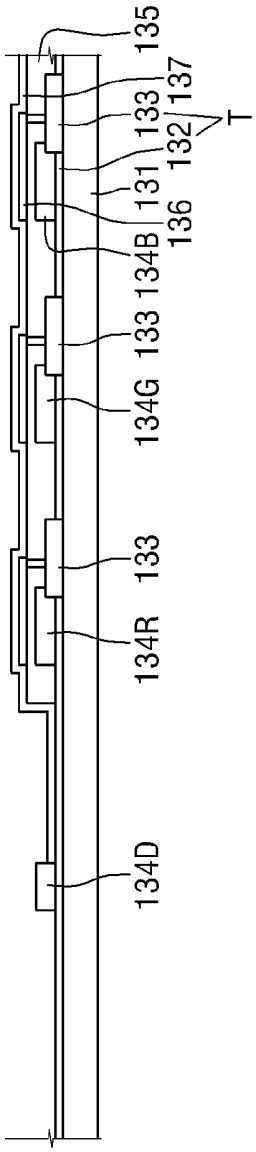

FIG.6

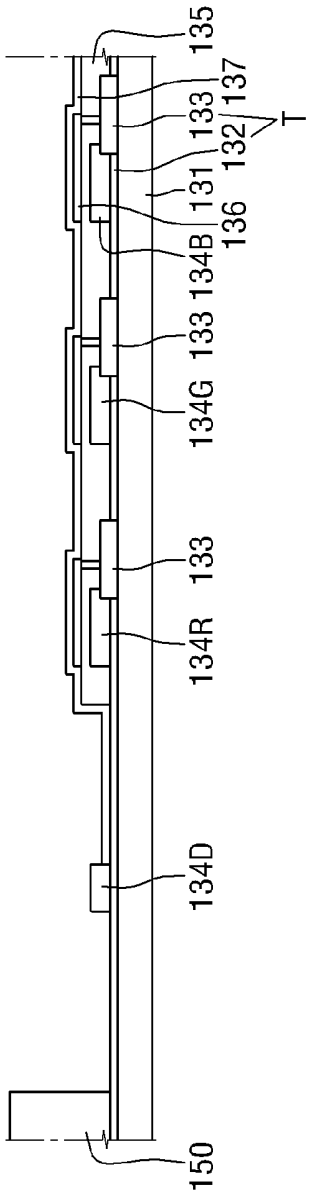

FIG.7

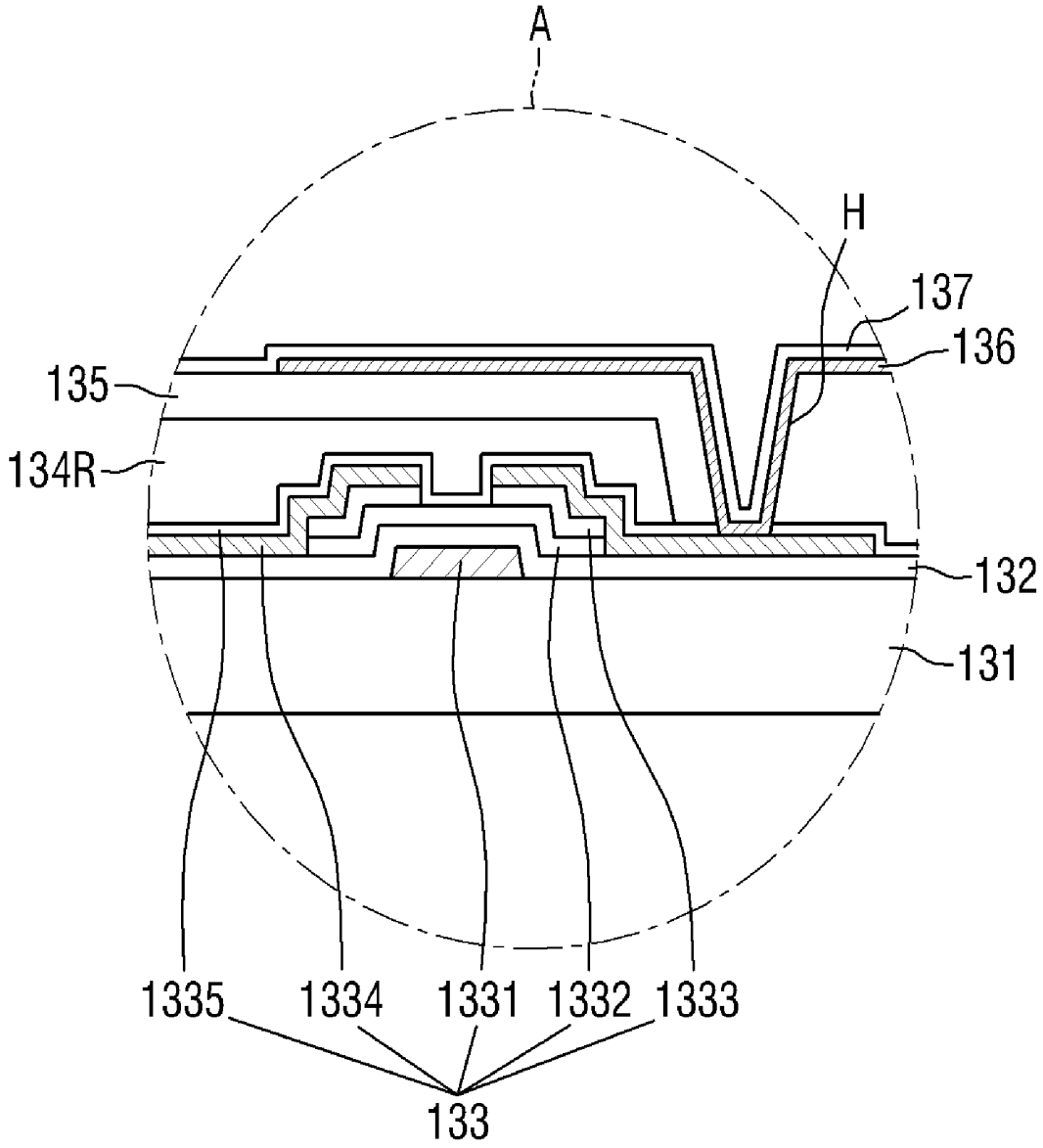

FIG.8

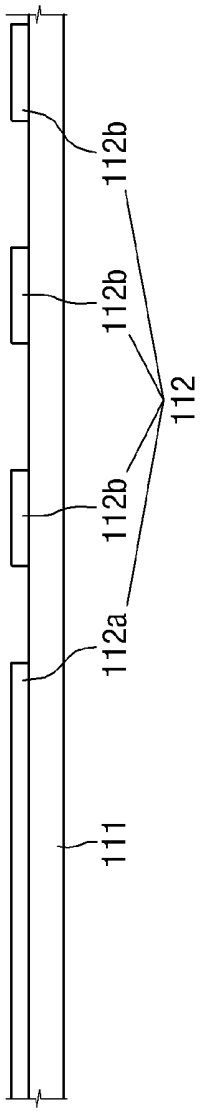

FIG.9

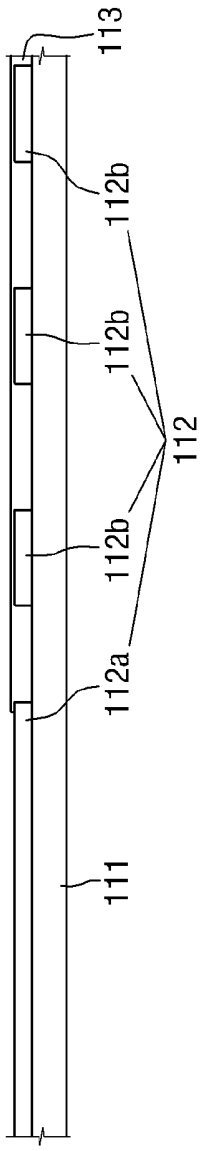

FIG.10

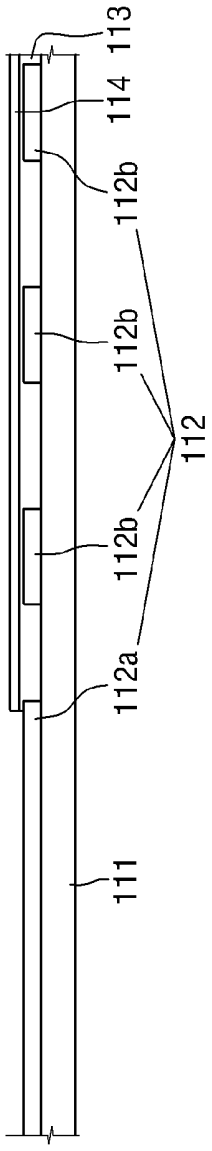

FIG.11

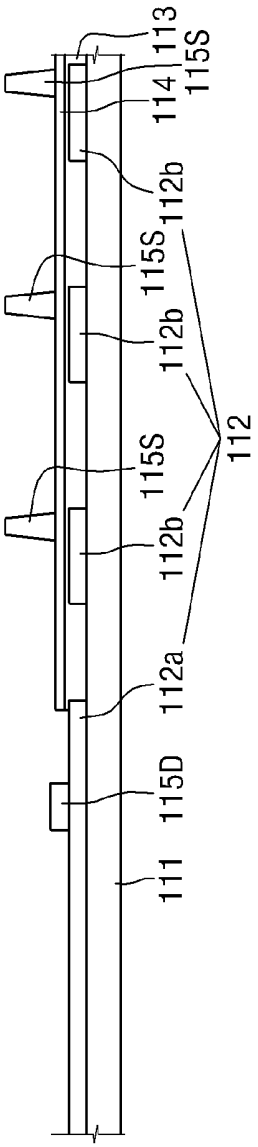

FIG.12

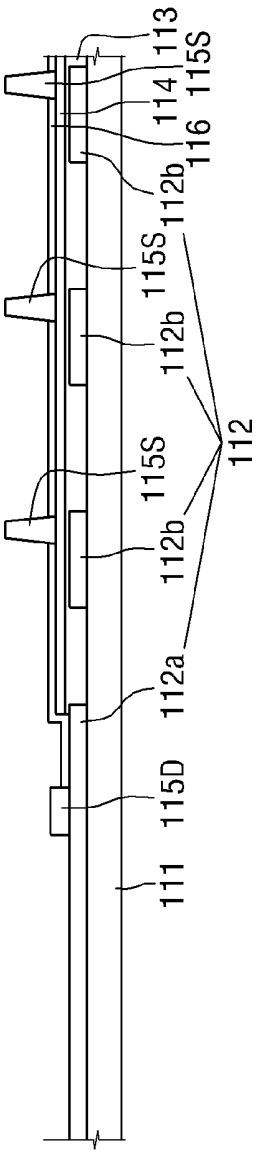

FIG.13

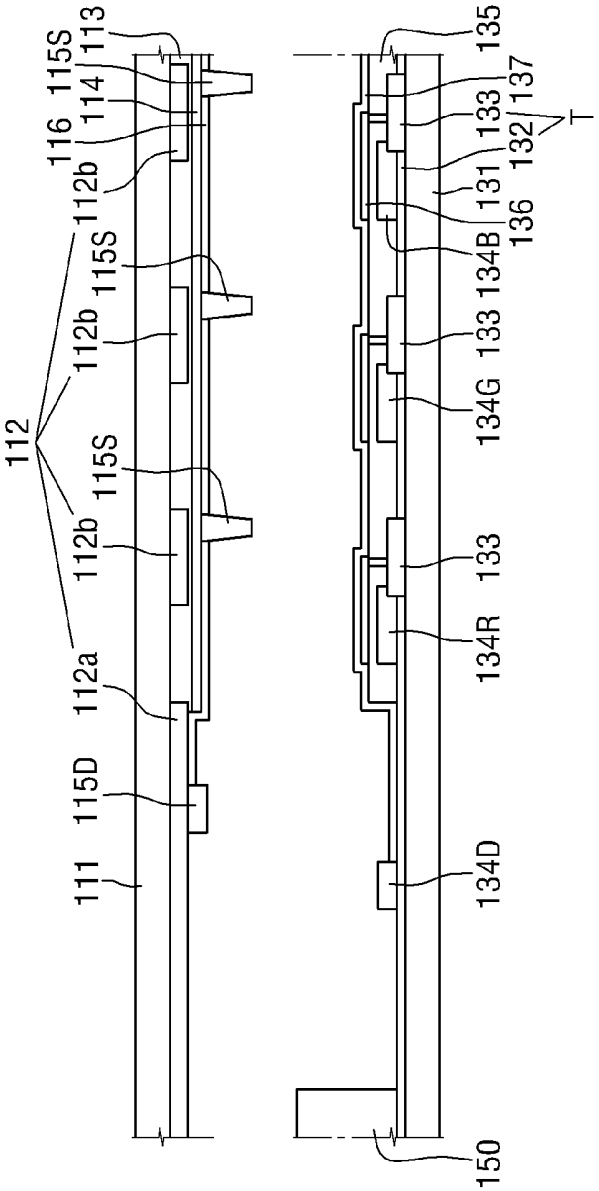
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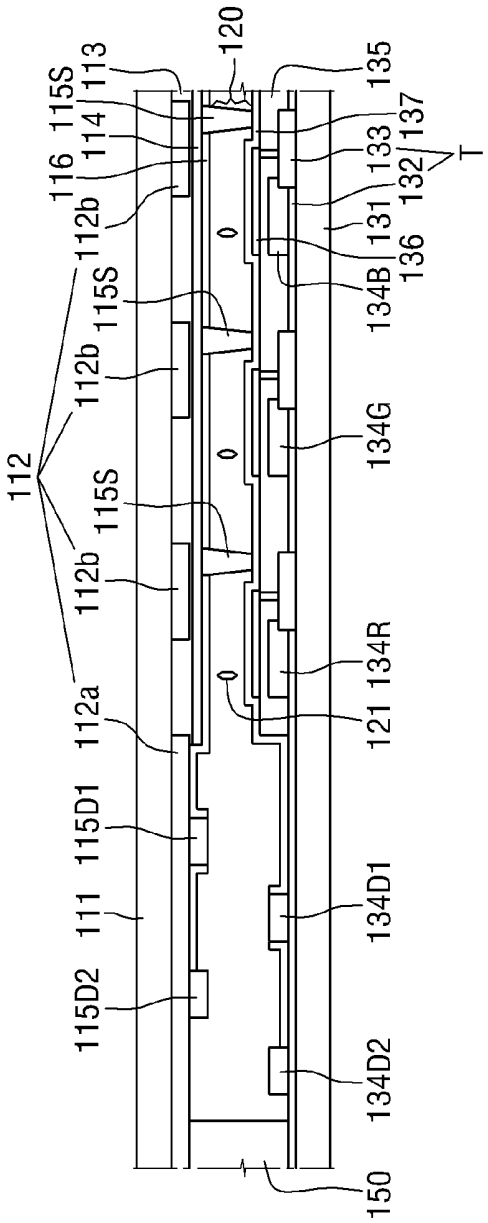
FIG.14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131
136
134B
134G
134R
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134D2
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T

LIQUID CRYSTAL DISPLAY PANEL AND METHOD FOR MANUFACTURING THE SAME

CLAIM OF PRIORITY

[0001] This application makes reference to, incorporates the same herein, and claims all benefits accruing under 35 U.S.C §119 from an application earlier filed in the Korean Industrial Property Office on 15 Sep. 2014, and there duly assigned Serial No. 10-2014-0122076 by that Office.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a liquid crystal display panel, and more particularly to a liquid crystal display panel that includes a dam pattern having both a physical barrier function and a chemical barrier function, and a method for manufacturing the same.

[0004] 2. Description of the Related Art

[0005] In general, a liquid crystal display panel for displaying an image includes a thin film transistor substrate in which thin film transistors (TFTs) are formed for respective pixels to independently drive the pixels, and an opposite substrate that is opposite to the thin film transistor substrate through a liquid crystal layer.

[0006] The liquid crystal display panel is divided into a display region in which an image is actually displayed and a non-display region that surrounds the display region. A pixel unit that includes a gate line, a data line, and a thin film transistor is formed in the display region, and a gate driving unit that applies a gate signal to a gate line is formed in the non-display region.

[0007] Recently, in order to reduce the area of the liquid crystal display panel, a structure that reduces the width of the non-display region has been developed. For example, a structure that maximally reduces the width of a light blocking layer that is formed in the non-display region of the opposite substrate and the width of a seal line that attaches the display substrate and the opposite substrate to each other has been developed.

[0008] As described above, if the width of the non-display region is reduced, an alignment layer and the seal line overlap each other. However, the adhesive force of the overlapping region of the alignment layer and the seal line may deteriorate, and thus the thin film transistor substrate and the opposite substrate of the liquid crystal display panel may be separated from each other.

[0009] Further, the water vapor permeability of the seal line is improved to cause the occurrence of corrosion and edge afterimage.

SUMMARY OF THE INVENTION

[0010] Accordingly, one subject to be solved by the present invention is to provide a liquid crystal display panel, which can physically and chemically control spreading of an alignment layer solution so as to prevent the alignment layer solution from permeating into a seal line forming region when an alignment layer is formed in a solution process.

[0011] Additional advantages, subjects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention.

[0012] In one aspect of the present invention, there is provided a liquid crystal display panel comprising: a first substrate; a second substrate that is opposite to the first substrate; a liquid crystal layer arranged in a first region between the first substrate and the second substrate; and a dam pattern arranged in a second region which surrounds a circumference of the first region as a region between the first substrate and the second substrate, and has an uppermost surface having a contact angle that is equal to or larger than 17° and equal to or smaller than 85° with respect to distilled water, wherein an overlayer does not exist on a surface of the uppermost surface.

[0013] The uppermost surface of the dam pattern may be made of only photoresist for manufacturing color filters.

[0014] The dam pattern may have a single-layer structure that is made of only photoresist for manufacturing color filters.

[0015] The liquid crystal display panel may further comprise a stacked structure of a thin film transistor (TFT) layer formed between the liquid crystal layer and the first substrate, a color filter layer formed between the liquid crystal layer and the thin film transistor (TFT) layer, a silicon nitride (SiNx) planarization layer formed between the liquid crystal layer and the color filter layer, a pixel electrode formed between the liquid crystal layer and the planarization layer, and a polyimide-based alignment layer formed between the liquid crystal layer and the pixel electrode.

[0016] The overlayer may be the planarization layer and/or the polyimide-based alignment layer.

[0017] The uppermost surface may have a contact angle that is equal to or larger than 5° and equal to or smaller than 18° with respect to polyimide.

[0018] In another aspect of the present invention, there is provided a liquid crystal display panel comprising: a first substrate; a second substrate that is opposite to the first substrate; a liquid crystal layer arranged in a first region between the first substrate and the second substrate; a stacked structure of a thin film transistor (TFT) layer formed between the liquid crystal layer and the first substrate, a color filter layer formed between the liquid crystal layer and the thin film transistor (TFT) layer, a silicon nitride (SiNx) planarization layer formed between the liquid crystal layer and the color filter layer, a pixel electrode formed between the liquid crystal layer and the planarization layer, and a polyimide-based alignment layer formed between the liquid crystal layer and the pixel electrode; and a dam pattern arranged in a second region which surrounds a circumference of the first region as a region between the first substrate and the second substrate, and has an uppermost surface that is made of only a photoresist composite for manufacturing color filters, wherein the planarization layer and the polyimide-based alignment layer do not exist on the uppermost surface.

[0019] The uppermost surface has a contact angle that is equal to or larger than 17° and equal to or smaller than 85° with respect to distilled water.

[0020] The uppermost surface has a contact angle that is equal to or larger than 5° and equal to or smaller than 18° with respect to polyimide.

[0021] The dam pattern may have a single-layer structure that is made of only photoresist for manufacturing color filters.

[0022] In another aspect of the present invention, there is provided a method for manufacturing a liquid crystal display panel, comprising: spreading a photoresist composite for manufacturing color filters on a first substrate on which a thin

film transistor (TFT) layer is formed; simultaneously forming a color filter layer and a dam pattern that surrounds the color filter layer by exposing and developing the photoresist composite for manufacturing the color filter; and forming a silicon nitride planarization layer on the color filter layer by depositing silicon nitride (SiNx) thereon after protecting the dam pattern by a mask.

[0023] The dam pattern may be made of only the photoresist composite for manufacturing the color filters, which has a contact angle that is equal to or larger than 17° and equal to or smaller than 85° with respect to distilled water.

[0024] The dam pattern may be made of only the photoresist composite for manufacturing the color filters, which has a contact angle that is equal to or larger than 5° and equal to or smaller than 18° with respect to polyimide.

[0025] The method may further comprise forming an alignment layer by spreading and hardening a polyimide alignment layer solution after forming the planarization layer. A polyimide-based alignment layer does not exist on a surface of the dam pattern.

[0026] According to the embodiments of the present invention, at least the following effects can be achieved.

[0027] The coating properties of the polyimide alignment layer with respect to the surface of the exposed uppermost surface can be lowered when the surface of the uppermost surface of the dam pattern comes in direct contact with the alignment layer in the alignment layer forming step.

[0028] The dam pattern according to the embodiments of the present invention can serve as both a physical barrier and a chemical barrier with respect to the polyimide alignment layer.

[0029] In the liquid crystal display panel according to the embodiments of the present invention, the overlapping of the seal line and the alignment layer can be minimized.

[0030] The effects according to the present invention are not limited to the contents as exemplified above, but further various effects are included in the description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] A more complete appreciation of the present invention, and many of the attendant advantages thereof, will become 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:

[0032] FIG. **1** is a cross-sectional view of a schematic portion of a liquid crystal display panel according to a first embodiment of the present invention;

[0033] FIGS. **2** to **6** are cross-sectional views schematically illustrating a step of manufacturing a lower substrate of FIG. **1**;

[0034] FIG. **7** is a schematic enlarged view of a region A of FIG. **1**;

[0035] FIGS. **8** to **13** are cross-sectional views schematically illustrating a process of manufacturing an upper substrate of FIG. **1**; and

[0036] FIG. **14** is a cross-sectional view of a schematic portion of a liquid crystal display panel according to a second embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0037] Features of the inventive concept and methods of accomplishing the same may be understood more readily by reference to the following detailed description of preferred embodiments and the accompanying drawings. The inventive concept may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete and will fully convey the concept of the inventive concept to those skilled in the art, and the inventive concept will only be defined by the appended claims.

[0038] In the drawings, the thickness of layers and regions are exaggerated for clarity. It will be understood that when an element or layer is referred to as being "on," "connected to" or "coupled to" another element or layer, the element or layer can be directly on, connected or coupled to another element or layer or intervening elements or layers. In contrast, when an element is referred to as being "directly on," "directly connected to" or "directly coupled to" another element or layer, there are no intervening elements or layers present. As used herein, connected may refer to elements being physically, electrically and/or fluidly connected to each other.

[0039] Like numbers refer to like elements throughout. It will be understood that, although the terms first, second, third, etc., may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section from another element, component, region, layer or section. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of the invention.

[0040] It will be further understood that the terms "comprises," "comprising," "includes" and/or "including," when used in this specification, specify the presence of stated features, integers, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0041] Although terms such as first, second, third, etc., may be used to describe diverse constituent elements, such constituent elements are not limited by the terms. The terms are used only to discriminate a constituent element from other constituent elements in the specification. The claims may not use the same terms, but instead may use the terms first, second, third, etc. with respect to the order in which an element is claimed. Accordingly, in the following description, a first constituent element may be a second constituent element in a claim.

[0042] Also, the terms "lower substrate" or "upper substrate" include, respectively, a first substrate or a second substrate and all the constituent elements formed on the first substrate or the second substrate.

[0043] Hereinafter, embodiments of the present invention will be described with reference to the accompanying drawings.

[0044] FIG. **1** is a cross-sectional view of a schematic portion of a liquid crystal display panel according to a first embodiment of the present invention.

[0045] Referring to FIG. **1**, a liquid crystal display panel according to the first embodiment of the present invention

may include a first region and a second region provided between a first substrate **131** and a second substrate **111** to be spatially separated from each other. The first region may be a display region, and the second region may be a non-display region.

[0046] In FIG. **1**, the first region may be a region in which a liquid crystal layer **120** is interposed between the first substrate **131** and the second substrate **111**, and the second region may be a region in which the liquid crystal layer **120** is not interposed between the first substrate **131** and the second substrate **111**.

[0047] Referring to FIG. **1**, the first region may include a structure in which the first substrate **131**, a thin film transistor layer **130**, color filter layers **134**R, **134**G, and **134**B, a planarization layer **135**, a pixel electrode **136**, a first alignment layer **137**, and the liquid crystal layer **120** are stacked in order between the first substrate **131** and the liquid crystal layer **120**. The thin film transistor layer **130** may include a gate insulating layer **132** and a thin film transistor **133**.

[0048] The second region may include a structure in which a gate insulating layer **132** and a first dam pattern **134**D are stacked in order on the first substrate **131**, or a structure in which the gate insulating layer **132** and the first alignment layer **137** are stacked in order on the first substrate **131**.

[0049] On the other hand, the first region may include a structure in which the second substrate **111**, a light blocking layer **112***b*, an overcoat layer **113**, a common electrode **114**, a spacer **115**S, a common electrode **114**, and the liquid crystal layer **120** are stacked in order between the second substrate **111** and the liquid crystal layer **120**.

[0050] Further, the second region may include a structure in which a light blocking layer **122***a*, a second dam pattern **115**D are stacked in order on the second substrate **111**, or a structure in which the light blocking layer **122***a* and a second alignment layer **116** are stacked in order on the second substrate **111**.

[0051] The seal line **150** may be formed in the second region, and may be interposed between the gate insulating layer **132** and a light blocking layer **112***a* to come in direct contact with them. The spacer **115**S may be interposed between the common electrode **114** and the first alignment layer **137** to come in direct contact with them. The liquid crystal layer **120** may be interposed between the first alignment layer **137** and the second alignment layer **116**, and may include optical anisotropic liquid crystals **121**.

[0052] Referring to FIG. **1**, an overlayer (e.g., a planarization layer and polyimide-based alignment layer) is not formed on one surface of the first dam pattern **134**D, but the first alignment layer **137** is formed to extend from the first region to the second region. The first alignment layer **137** may not exceed the first dam pattern **134**D. The first dam pattern **134**D is illustrated to have a single-layer structure, but is not limited thereto.

[0053] The first dam pattern **134** can physically prevent an alignment layer solution from flowing up to a region in which the seal line **150** of the second region is to be formed in the process of forming the alignment layer in the first region in a liquid process, and also chemically prevent the alignment layer solution from flowing up to a seal line **150** forming region of the second region using the characteristics of a material of the first dam pattern **134**D having no affinity with the alignment layer solution.

[0054] The material of the first dam pattern **134**D is not specially limited if the material has no affinity with the alignment layer solution to the extent that the alignment layer solution is not coated thereon. As a non-limiting example, the first dam pattern **134**D may be composed of a material having a contact angle that is equal to or larger than 17° and equal to or smaller than 85° with respect to distilled water. Contact angle measurements are often used as an empirical indicator of 'wettability' and interfacial tension. Further, the first dam pattern **134**D may be composed of a material having the contact angle that is equal to or larger than 5° and equal to or smaller than 18° with respect to polyimide.

[0055] As a non-limiting example, the first dam pattern **134**D may be composed of a photoresist composite for manufacturing a color filter, and more particularly, may be composed of a photoresist composite for manufacturing a blue (B) color filter **134**B.

[0056] Hereinafter, referring to FIGS. **1** to **3**, a process of forming the first dam pattern **134**D of FIG. **1** as the photoresist composite for manufacturing the blue (B) color filter **134**B will be described in detail.

[0057] Referring to FIG. **2**, the thin film transistor layer **130**, the red (R) color filter **134**R, and the green color filter **134**G may be formed on the first substrate **131** in order.

[0058] The first substrate **131** may be composed of a transparent material that can transmit light. As a non-limiting example, the first substrate **131** may be a glass substrate or a transparent polymer film.

[0059] The thin film transistor layer **130** may include the gate insulating layer **132** and the thin film transistor **133**, and the gate insulating layer **132** may be formed to extend from the first region to the second region. As a non-limiting example, the gate insulating layer **132** may be composed of a silicon oxide layer (SiO2).

[0060] The thin film transistor **130** is a switching device that applies and cuts off a signal to the liquid crystals **121**. Hereinafter, the structure of the thin film transistor **130** will be described in detail with reference to region A shown in more detail in FIG. **7**.

[0061] The red (R) color filter **134**R may be formed by spreading, exposing, and developing the photoresist composite for manufacturing the red (R) color filter. The green (G) color filter **134**G may be formed by spreading, exposing, and developing the photoresist composite for manufacturing the green (G) color filter. The forming order of the red (R) color filter **134**R and the green (G) color filter **134**G is not specially limited, and for example, in the case of a stripe pattern, the green (G) color filter **134**G may be formed after the red (R) color filter **134**R is formed.

[0062] Referring to FIG. **3**, the blue (B) color filter **134**B may be formed after the red (R) color filter **134**R and the green (G) color filter **134**G are formed, and in this process, the first dam pattern **134**D may be formed together. The blue (B) color filter **134**B may be formed by spreading, exposing, and developing the photoresist composite for manufacturing the blue (B) color filter **134**B. In the same manner, the first dam pattern **134**D may be formed by spreading, exposing, and developing the photoresist composite for manufacturing the blue (B) color filter.

[0063] The planarization layer **135** may be formed after the blue (B) color filter **134**B and the first dam pattern **134**D are formed. In a process of forming the planarization layer **135**, the first dam pattern **134**D is protected by a mask M. Accordingly, the planarization layer **135** is formed only in the first region, but is not formed on the surface of the first dam pattern **134**D of the second region. The planarization layer **135** may be formed by depositing silicon nitride (SiNx).

[0064] The silicon nitride SiNx has the contact angle that is smaller than 17° with respect to the distilled water, and has the contact angle that is smaller than 5° with respect to polyimide. Accordingly, the coating properties become superior in the case where the polyimide-based alignment layer comes in contact with the planarization layer **135** that includes silicon nitride (SiNx).

[0065] This means that if the planarization layer **135** that includes silicon nitride (SiNx) had been formed on the surface of the first dam pattern **134**D to form the uppermost surface, the uppermost surface of the first dam pattern **134**D could have been easily coated by the polyimide-based alignment layer.

[0066] According to the liquid crystal display panel according to the first embodiment of the present invention, since the surface of the uppermost surface of the first dam pattern **134**D is composed of a material that has no affinity with the polyimide-based alignment layer, and the first dam pattern **134**D is protected by the mask during deposition of the silicon nitride (SiNx), it becomes possible to make the polyimide-based alignment layer not easily coated on the first dam pattern **134**D.

[0067] For example, in the case of forming the first dam pattern **134**D only as the photoresist composite for manufacturing the blue (B) color filter, the contact angle thereof with respect to the distilled water is 85°, and the contact angle thereof with respect to the polyimide is 18°.

[0068] The coating properties of the polyimide-based alignment layer can be lowered by forming the first dam pattern **134** as the photoresist composite for manufacturing the blue (B) color filter having low surface energy.

[0069] FIGS. **4** and **5** schematically illustrate a process of forming the pixel electrode **136** and the first alignment layer **137** on the planarization layer **135** to complete the lower substrate.

[0070] Referring to FIG. **4**, after the planarization layer **135** is formed, the mask M may be removed, and the pixel electrode **136** may be formed on the planarization layer **135**. The pixel electrode **136** may be provided to a region that corresponds to the color filter layers **134**R, **134**G, and **134**B. The pixel electrode **136** may be made of a transparent conductive material. As a non-limiting example, the pixel electrode **136** may be made of ITO (Indium Tin Oxide).

[0071] Referring to FIG. **7**, region A of FIG. **1**, the pixel electrode **136** may be electrically connected to a source/drain electrode **1334** through a through-hole H formed on the planarization layer **135**.

[0072] Referring to FIG. **5**, the first alignment layer **137** may be formed on one surface of the planarization layer **135** on which the pixel electrode **136** is formed. The first alignment layer **137** may guide easy arrangement of the liquid crystals **121**. The first alignment layer **137** may be formed to extend from the first region to the second region. However, as described above, it is difficult for the first alignment layer **137** to flow up to the seal line **150** over the first dam pattern **134** due to the physical and chemical barrier functions of the first dam pattern **134**D. The first alignment layer **137** may be a polyimide-based alignment layer.

[0073] FIG. **6** schematically illustrates a step of forming the seal line **150** in the second region. The seal line **150** may be formed on the gate insulating layer **132** that is formed to extend from the first region to the second region, but is not limited thereto.

[0074] Based on the planarization layer **135** in the first region, the first dam pattern **134**D and the seal line **150** may be formed in order. That is, the first dam pattern **134**D is arranged between the seal line **150** and the first region.

[0075] FIG. **7** is a schematic enlarged view of a region A of FIG. **1**.

[0076] Referring to FIG. **7**, the thin film transistor **133** may include a gate electrode **1331**, a semiconductor layer **1332**, an ohmic contact layer **1333**, a source/drain electrode **1334**, and a passivation layer **1335**.

[0077] The gate electrode **1331** may be made of a conductive material, such as metal. For example, the gate electrode **1331** may be made of at least one selected from the group including aluminum (Al), an aluminum alloy (AlNd), tungsten (W), chrome (Cr), titanium (Ti), and molybdenum (Mo).

[0078] The gate insulating layer **132** may be provided between the gate electrode **1331** and the semiconductor layer **1332**.

[0079] The semiconductor layer **1332** may be provided on the gate insulating layer **132** that corresponds to the gate electrode **1331**. The semiconductor layer **1332** may be made of pure amorphous silicon (a-Si:H).

[0080] The ohmic contact layer **1333** may be provided on the semiconductor layer **1332**, and may be made of impurity-injected amorphous silicon (N+a-Si:H). The ohmic contact layer **1333** may expose a part of the surface of the semiconductor layer **1332**, or may be formed in an inversion symmetry shape based on the region in which a part of the surface of the semiconductor layer **1332** is exposed.

[0081] The source/drain electrode **1334** may be provided on the ohmic contact layer **1333**. In the same manner as the ohmic contact layer **1333**, the source/drain electrode **1334** may expose a part of the surface of the semiconductor layer **1332**, or may be formed in an inversion symmetry shape based on the region in which a part of the surface of the semiconductor layer **1332** is exposed.

[0082] The source/drain electrode **1334** may be made of at least one selected from the group including molybdenum (Mo), titanium (Ti), tungsten (W), tungsten molybdenum (MoW), chrome (Cr), nickel (Ni), aluminum (Al), and an aluminum alloy (AlNd).

[0083] In a gap section between the source/drain electrodes **1334** in which a part of the surface of the semiconductor layer **1332** is exposed, a channel (not illustrated) for turning on the source/drain electrode **1334** may be formed.

[0084] The passivation layer **1335** may be formed on the source/drain electrode **1334** and the exposed semiconductor layer **1332** to protect the source/drain electrode **1334** and the exposed semiconductor layer **1332**. The passivation layer **1335** may be composed of a silicon oxide (SiO2) layer, a silicon nitride (SiNx) layer, or a double layer thereof.

[0085] Hereinafter, referring to FIGS. **1** and **8** to **12**, a process of forming an upper substrate of the liquid crystal display panel of FIG. **1** will be described in detail.

[0086] Referring to FIG. **8**, a light blocking layer **112** may be formed on the second substrate **111**. The light blocking layer **112** may include the light blocking layer **112***a* that is formed in the second region and the light blocking layer **112***b* that is formed in the first region.

[0087] The light blocking layer **112***a* may be in the shape of a closed loop that surrounds the first region to block light leakage. The light blocking layer **112***b* may be formed in a

region that corresponds to the thin film transistor **133**, a gate line (not illustrated), and a data line (not illustrated) to block light leakage.

[0088] Referring to FIG. **9**, the overcoat layer **113** may be formed on the light blocking layer **112***b* and partially on the light blocking layer **112***a*. The overcoat layer **113** is provided to improve surface planarization and adhesive force with the common electrode **114** (FIG. **10**), and may be made of, for example, acrylic resin.

[0089] Referring to FIG. **10**, the common electrode **114** may be formed on the overcoat layer **113**. The common electrode **114** may be formed of a transparent conductive material. For example, the common electrode **114** may be made of ITO (indium Tin Oxide) or IZO (Indium Zinc Oxide).

[0090] Referring to FIG. **11**, the spacer **115**S may be formed on the common electrode **114**. In addition, the second dam pattern **115**D may be formed on the light blocking layer **112***a* of the second region. The second dam pattern **115**D may be formed of the same material in the same process as the process of the spacer **115**S. The spacer **115**S may serve to maintain the cell gap between the lower substrate (FIGS. **2-7**) and the upper substrate (FIGS. **8-12**).

[0091] Referring to FIG. **12**, after the spacer **115**S and the second dam pattern **115**D are formed, the second alignment layer **116** may be formed. The second alignment layer **116** may be a polyimide-based alignment layer in the same manner as the first alignment layer **137**.

[0092] Organic polymer resin that forms the spacer **115**S has no affinity with the second alignment layer **116**, and thus the second alignment layer **116** is not coated on the surface of the spacer **115**S. Accordingly, the second alignment layer **116** forms a coating layer on the common electrode **114**, between the spacers **115**S. In this process, a part of a side wall of the spacer **115**S may come in direct contact with the second alignment layer **116**, but it would be difficult that the second alignment layer **116** forms the coating layer on the side wall of the spacer **115**S as substantially high as the height of the coating layer that is formed on the common electrode **114**.

[0093] As described above, the second dam pattern **115**D is made of the same material as the spacer **115**S that has no affinity with the second alignment layer **116**, and thus may act as the physical and chemical barriers with respect to the second alignment layer **116** in the same manner as the first dam pattern **134**D. Accordingly, the second alignment layer **116** forms a coating layer on a portion of light blocking layer **112***a* in the second region between the dam pattern **115**D and the common electrode **114**.

[0094] FIG. **13** schematically illustrates a process of combining the lower substrate of FIG. **6** and the upper substrate of FIG. **12** with each other.

[0095] As shown in FIG. **13**, the liquid crystal display panel of FIG. **1** can be manufactured by combining the upper substrate of FIG. **12** with the lower substrate of FIG. **6** and injecting the liquid crystals **121** (FIG. **1**) between them.

[0096] FIG. **14** is a cross-sectional view of a schematic portion of a liquid crystal display panel according to a second embodiment of the present invention.

[0097] A liquid crystal display panel of FIG. **14** is different from the liquid crystal display panel of FIG. **1** on the point that two dam patterns **134**D1 and **134**D2 are formed on the first substrate **131** and two dam patterns **115**D1 and **115**D2 are formed on the second substrate **111**.

[0098] Referring to FIG. **14**, even if the alignment layer **137** flows to the dam pattern **134**D2 over the dam pattern **134**D1, the alignment layer **137** is not coated on the surface of the dam pattern **134**D1. This is because the dam patterns **134**D1 and **134**D2 act as physical and chemical barriers with respect to the alignment layer **137** as described above.

[0099] In the same manner, even if the alignment layer **116** flows to the dam pattern **115**D2 over the dam pattern **115**D1, the alignment layer **116** is not coated on the surface of the dam pattern **115**D1. This is because the dam patterns **115**D1 and **115**D2 act as physical and chemical barriers with respect to the alignment layer **116** as described above.

[0100] While the invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in provide and detail may be made therein without departing from the spirit and scope of the invention as defined by the following claims. The exemplary embodiments should be considered in a descriptive sense only and not for purposes of limitation.

What is claimed is:

1. A liquid crystal display panel comprising:
- a first substrate;
- a second substrate that is opposite to the first substrate;
- a liquid crystal layer having liquid crystals between the first substrate and the second substrate, the liquid crystals being arranged in a first region of the first and second substrates; and
- a dam pattern arranged in a second region of the first and second substrates which surrounds a circumference of the first region as a region between the first substrate and the second substrate, the dam pattern having an uppermost surface having a contact angle that is equal to or larger than 17° and equal to or smaller than 85° with respect to distilled water, the uppermost surface being made of a material having no affinity for a polyimide-based layer.

2. The liquid crystal display panel of claim **1**, wherein the uppermost surface of the dam pattern is made of only photoresist for manufacturing color filters.

3. The liquid crystal display panel of claim **1**, further comprising a stacked structure of a thin film transistor (TFT) layer formed between the liquid crystal layer and the first substrate, a color filter layer formed between the liquid crystal layer and the thin film transistor (TFT) layer, a silicon nitride (SiNx) planarization layer formed between the liquid crystal layer and the color filter layer, a pixel electrode formed between the liquid crystal layer and the planarization layer, and a polyimide-based alignment layer formed between the liquid crystal layer and the pixel electrode.

4. The liquid crystal display panel of claim **3**, the planarization layer and the polyimide-based alignment layer forming an overlayer.

5. The liquid crystal display panel of claim **1**, wherein the uppermost surface has a contact angle that is equal to or larger than 5° and equal to or smaller than 18° with respect to polyimide.

6. A liquid crystal display panel comprising:
- a first substrate;
- a second substrate that is opposite to the first substrate;
- a liquid crystal layer having liquid crystals between the first substrate and the second substrate, the liquid crystals being arranged in a first region of the first and second substrates;

a stacked structure of a thin film transistor (TFT) layer formed between the liquid crystal layer and the first substrate, a color filter layer formed between the liquid crystal layer and the thin film transistor (TFT) layer, a silicon nitride (SiNx) planarization layer formed between the liquid crystal layer and the color filter layer, a pixel electrode formed between the liquid crystal layer and the planarization layer, and a polyimide-based alignment layer formed between the liquid crystal layer and the pixel electrode; and

a dam pattern arranged in a second region which surrounds a circumference of the first region as a region between the first substrate and the second substrate, the dam pattern having an uppermost surface that is made of only a photoresist composite for manufacturing color filters, wherein the planarization layer and the polyimide-based alignment layer do not exist on the uppermost surface.

7. The liquid crystal display panel of claim **6**, wherein the uppermost surface has a contact angle that is equal to or larger than 17° and equal to or smaller than 85° with respect to distilled water.

8. The liquid crystal display panel of claim **6**, wherein the uppermost surface has a contact angle that is equal to or larger than 5° and equal to or smaller than 18° with respect to polyimide.

9. A method for manufacturing a liquid crystal display panel, comprising:

spreading a photoresist composite for manufacturing color filters on a first substrate on which a thin film transistor (TFT) layer is formed;

simultaneously forming a color filter layer and a dam pattern that surrounds the color filter layer by exposing and developing the photoresist composite for manufacturing the color filters; and

forming a silicon nitride planarization layer on the color filter layer by depositing silicon nitride (SiNx) thereon after protecting the dam pattern by a mask.

10. The method of claim **9**, wherein the dam pattern is made of only the photoresist composite for manufacturing the color filters, which has a contact angle that is equal to or larger than 17° and equal to or smaller than 85° with respect to distilled water.

11. The method of claim **9**, wherein the dam pattern is made of only the photoresist composite for manufacturing the color filters, which has a contact angle that is equal to or larger than 5° and equal to or smaller than 18° with respect to polyimide.

12. The method of claim **9**, further comprising forming a polyimide-based alignment layer by spreading and hardening a polyimide alignment layer solution after forming the planarization layer, the dam pattern forming a barrier to the spreading of the polyimide alignment layer solution, the dam pattern having no affinity for the polyimide-based alignment layer solution such that the polyimide-based alignment layer does not exist on a surface of the dam pattern.

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摘要(译)

液晶显示面板及其制造方法。液晶显示面板包括具有第一基板的下基板;上基板，具有与第一基板相对的第二基板;液晶层设置在下基板和上基板之间，使得液晶布置在第一基板和第二基板之间的第一区域中;布置在第二区域中的坝图案，所述第二区域围绕第一区域的圆周，作为第一基板和第二基板之间的区域，坝图案具有物理屏障功能和化学屏障功能。