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(54) Title: Solid device with pattern-formed film material and pattern-forming method

(57) Abstract

The problem to be solved is, for example, to prevent the damage to thin-film electrodes associated with the substrate cleaning with a brush scrubber or the like in a liquid crystal display in which a thin-film electrode is pattern-formed on the substrate surface. The solution is as follows. Pixel electrodes 22 formed by ITO are provided in a matrix shape on a transparent insulating substrate of a TFT array side substrate 11 which constitutes a polysilicon-typed TFT active-matrix liquid crystal display. Further, on the transparent insulating substrate of the array side substrate 11, in order to prevent the damage to the pixel electrodes 22 during the substrate cleaning with a brush scrubber or the like, a dummy film 5 with a film thickness thinner than that of the pixel electrode 22 is provided so as to surround the periphery of the pixel electrodes 22 group.

What is claimed is,

1. A solid device with a pattern-formed film material, wherein, the solid device brush-cleaned in a state where an appropriate film material has been pattern-formed on a surface, comprises a dummy film which is pattern-formed so as to surround a periphery of the film material on the same surface of the device.
2. The solid device with a pattern-formed film material according to claim 1, wherein, the dummy film is pattern-formed with a film thickness thinner than a film thickness of the film material.
3. The solid device with a pattern-formed film material according to claim 1 or 2, wherein, the dummy film has a gradient that the film thickness thereof is reduced gradually toward the peripheral of the device, or is pattern-formed stepwise.
4. The solid device with a pattern-formed film material according to any one of claims 1 to 3, wherein, the dummy film is pattern-formed of the same material as the film material.
5. The solid device with a pattern-formed film material according to any one of claims 1 to 3, wherein, the dummy film is pattern-formed of a different material from the film material.
6. The solid device with a pattern-formed film material according to any one of claims 1 to 5, wherein, the solid device is a transparent insulating substrate provided with a semiconductor element for liquid crystal driving of a liquid crystal display, the film material is a pixel

transparent electrode pattern-formed on a surface of the transparent insulating substrate.

7. A method for pattern-forming a film material on a surface of a solid device, wherein,

at least a film thickness of the film material pattern-formed in an outermost periphery of the solid device is made thinner than a film thickness of the film material pattern-formed in other portions.

8. A pattern-forming method, comprising:

a process of depositing a film material on a surface of a solid device; and

a process of etching the film material by plasma dry etching with increased plasma reaction pressure so that a film thickness of the deposited film material becomes thinner towards an end portion thereof.

DETAILED DESCRIPTION OF THE INVENTION

[0001]

Field of the Invention

The present invention relates to a solid device with a pattern-formed film material such as a liquid crystal display with a pattern-formed transparent electrode as well as to a pattern-forming method.

[0002]

Related Art

Conventionally, in a display, for example, in a polysilicon-typed TFT (Thin Film Transistor: TFT) mode active matrix liquid crystal display, etc., a transparent thin-film electrode such as ITO (Indium Tin Oxide) is used as the pixel electrode thereof. This transparent thin-film electrode is formed by patterning after forming the polysilicon-type TFT on a glass substrate or the like. Then, especially for improving the yield, a substrate cleaning with a brush scrubber or the like is carried out before moving on to the subsequent manufacturing process.

[0003]

Here, the substrate cleaning using the brush scrubber will be described briefly with reference to FIG. 10 to FIG. 12. A partial planar structure of the TFT array side substrate 1 of the liquid crystal display described above is shown in FIG. 10, and a cross-sectional structure taken along the line X-X of FIG. 10 is shown in FIG. 11. Incidentally, in the cross-sectional structure shown in FIG. 11, illustrations of TFT or the like, portions in the liquid crystal driving other than the pixel electrode are omitted.

[0004]

In the TFT array side substrate 1 shown in FIG. 10, the pixel electrode 2 of each of

the display pixels constituting the liquid crystal display is pattern-formed in the vicinity of the intersection points of the drain wires DL connected to the drain driver and the gate lines GL connected to the gate driver. These pixel electrodes 2 are formed on approximately the entire surface of the TFT array side substrate 1 with a predetermined number of pixels in a matrix shape, but only a part of them is shown in FIG. 10.

[0005]

Further, the pixel electrodes 2 are made of the ITO, and are connected to the source electrodes (not shown) of the TFT via the contact holes 3. Further, the pixel electrodes 2 are, as shown in FIG. 11, formed on a transparent insulating substrate (glass substrate or the like) 1a constituting the TFT array side substrate 1.

[0006]

Next, based on the plan view shown in FIG. 12, a cleaning mode of the TFT array side substrate 1 using a brush scrubber will be described. During substrate cleaning, as shown in FIG. 12, the TFT array side substrate 1 is placed on a predetermined rotating table (not shown), and when rotating the rotating table, the brush portion 4 of the brush scrubber rotated similarly is made to abut against the surface of the substrate 1. Then, the entire surface of the substrate 1 is cleaned while moving the brush portion 4 in arrow Y direction in FIG. 12. It should be noted that at this time, a chemical cleaning using a chemical solution is often used in combination.

[0007]

Problems to be solved by the Invention

Incidentally, in the case where the TFT array side substrate 1 having the pixel electrodes 2 of ITO or the like as described above which are pattern-formed on the topmost portion thereof is cleaned by using a brush scrubber, as shown in FIG. 13, the electrode first abutting against the rotating brush 4a of the brush scrubber among the pixel electrodes 2, may be damaged by the mechanical force thereof. In this way, when the pixel electrode 2 is damaged in the cleaning process of the substrate 1, it becomes a pixel defect, and is thus to be a cause of lowering the product yield of liquid crystal display.

[0008]

Incidentally, in the solid device where a film material is pattern-formed on the surface and then surface-cleaned by the brush scrubber or the like, the device not being limited to such liquid crystal display but also including semiconductor device and the like, , such circumstances have also become generally common.

[0009]

The present invention has been made in view of the above circumstances, and the

object thereof is to provide a solid device with a pattern-formed film material and a pattern-forming method capable of well protecting the film material pattern-formed on the surface with respect to the cleaning with a brush scrubber or the like, and consequently improving the product yield.

[0010]

Means for Solving the Problems

To achieve the above object, in the invention according to claim 1, a solid device brush-cleaned in a state where an appropriate film material has been pattern-formed on a surface, comprises a dummy film which is pattern-formed so as to surround a periphery of the film material on the same surface of the device.

[0011]

In this configuration, a dummy film which is pattern-formed so as to surround the periphery of the film material in the same surface of the solid device is provided. Accordingly, when the solid device is brush-cleaned by using a brush scrubber or the like, the brush of the brush scrubber first abuts against the dummy film before abutting against the pattern-formed film material. Therefore, the damage to the film material by the mechanical force of the brush of the rotating brush scrubber is prevented.

[0012]

Further, in the invention according to claim 2, in the solid device with a pattern-formed film material of claim 1, the dummy film is pattern-formed with a film thickness thinner than the film thickness of the film material.

[0013]

In this configuration, when the solid device is brush-cleaned by using for example a brush scrubber or the like, the brush of the brush scrubber first reduces the riding step difference of the pattern-formed dummy film which is thinner than the film thickness of the film material, so as to ride on the film material. Therefore, the damage to the film material by the mechanical force of the brush of the rotating brush scrubber is well prevented.

[0014]

Further, in the invention according to claim 3, in the solid device with a pattern-formed film material of claim 1 or 2, the dummy film has a gradient that the film thickness thereof is reduced gradually toward the peripheral of the device, or is pattern-formed stepwise.

[0015]

In this configuration, when the solid device is brush-cleaned by using for example a brush scrubber or the like, the brush of the brush scrubber rides on the film material

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