



US010305039B2

(12) **United States Patent**  
**Li**

(10) **Patent No.:** **US 10,305,039 B2**  
(45) **Date of Patent:** **May 28, 2019**

(54) **MATERIAL PROPERTY TESTING DEVICE  
AND MANUFACTURING METHOD FOR  
THE SAME**

*H01L 51/0018* (2013.01); *H01L 51/56*  
(2013.01); *G01N 2201/0621* (2013.01)

(71) Applicant: **Wuhan China Star Optoelectronics  
Semiconductor Display Technology  
Co., Ltd.**, Wuhan, Hubei (CN)

(58) **Field of Classification Search**  
CPC ..... *H01L 51/0031*; *G01N 21/255*  
See application file for complete search history.

(72) Inventor: **Songshan Li**, Guangdong (CN)

(56) **References Cited**

(73) Assignee: **Wuhan China Star Optoelectronics  
Semiconductor Display Technology  
Co., Ltd.**, Wuhan, Hubei (CN)

U.S. PATENT DOCUMENTS

8,872,244 B1 \* 10/2014 He ..... *H01L 29/78*  
257/288  
2017/0077194 A1 3/2017 Liu et al.

(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 0 days.

FOREIGN PATENT DOCUMENTS

CN 105529409 A 4/2016  
CN 106898710 A 6/2017  
CN 206225365 U 6/2017

(Continued)

(21) Appl. No.: **15/556,065**

(22) PCT Filed: **Jul. 21, 2017**

(86) PCT No.: **PCT/CN2017/093824**

§ 371 (c)(1),

(2) Date: **Sep. 6, 2017**

Primary Examiner — Thomas L Dickey

(74) Attorney, Agent, or Firm — Andrew C. Cheng

(87) PCT Pub. No.: **WO2019/000519**

PCT Pub. Date: **Jan. 3, 2019**

(65) **Prior Publication Data**

US 2019/0006594 A1 Jan. 3, 2019

(51) **Int. Cl.**

*H01L 51/00* (2006.01)

*H01L 27/32* (2006.01)

*H01L 51/56* (2006.01)

*G01N 21/25* (2006.01)

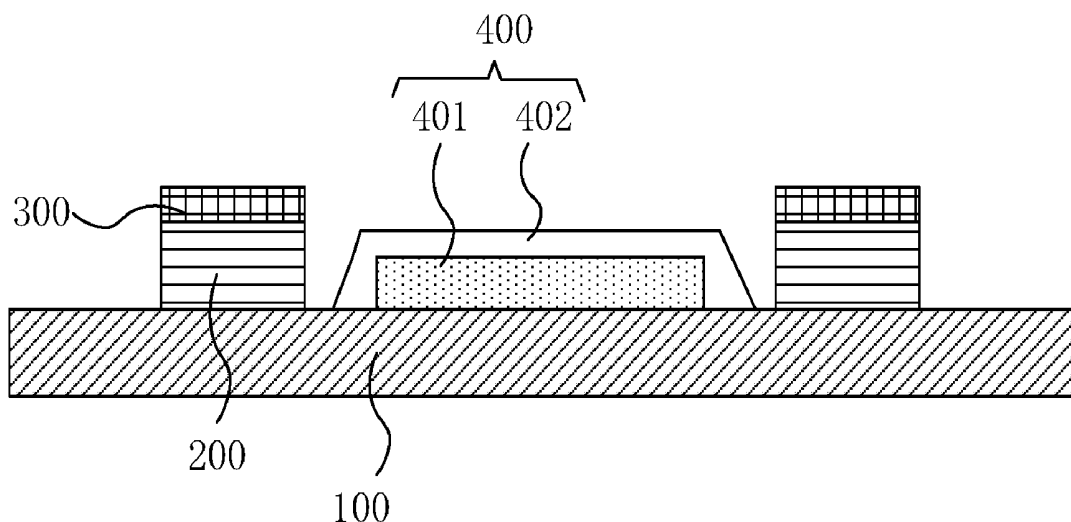
(52) **U.S. Cl.**

CPC ..... *H01L 51/0031* (2013.01); *G01N 21/255*  
(2013.01); *H01L 27/322* (2013.01); *H01L*  
*27/3246* (2013.01); *H01L 27/3248* (2013.01);

(57) **ABSTRACT**

A material property testing device and a manufacturing method are disclosed. The device includes: a substrate; a metal gate electrode; an auxiliary layer disposed on the metal gate electrode, and the metal gate electrode is located between the substrate and the auxiliary layer; a function layer disposed on the substrate. In the formation process of the function layer, an organic photoresist is attached on the auxiliary layer for a period of time, and the function layer is used for cooperating with a light-emitting device to test the property of the material. A film of the organic photoresist being disposed is even such that after exposing and developing, the function layer having an ideal pattern is obtained so as to ensure the testing effect of the material property testing device.

**12 Claims, 5 Drawing Sheets**



(56)

**References Cited**

FOREIGN PATENT DOCUMENTS

JP	2009070708 A	4/2009
JP	2015142277 A	8/2015

\* cited by examiner

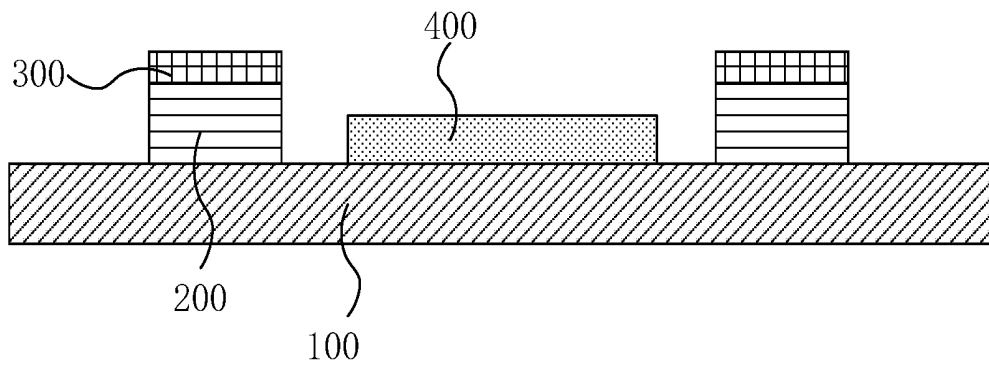


FIG.1

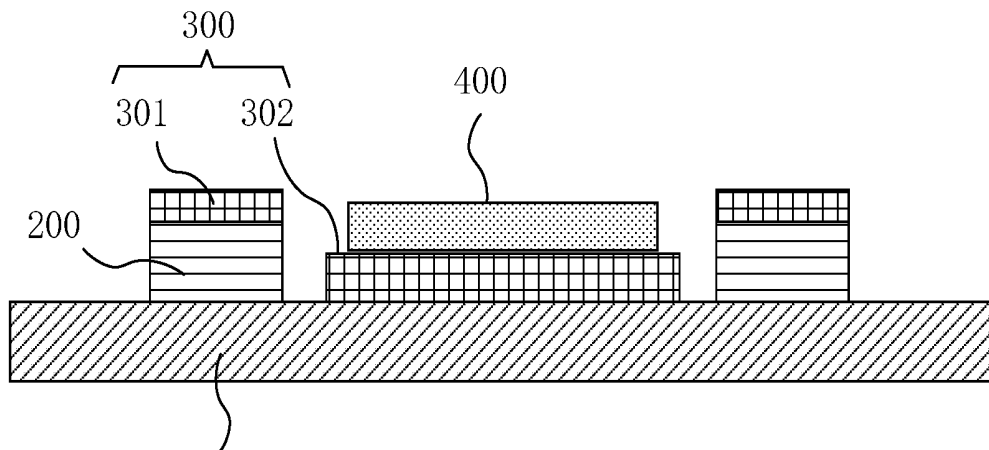


FIG.2

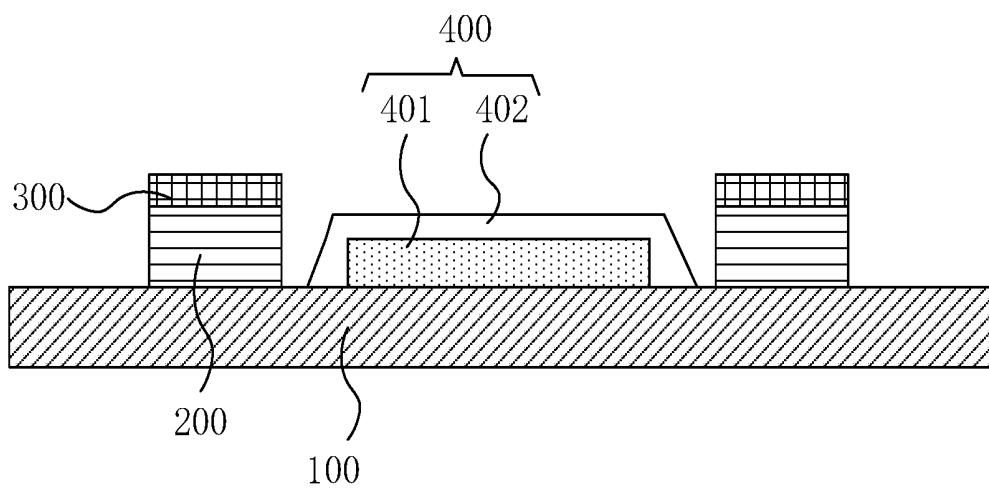


FIG.3

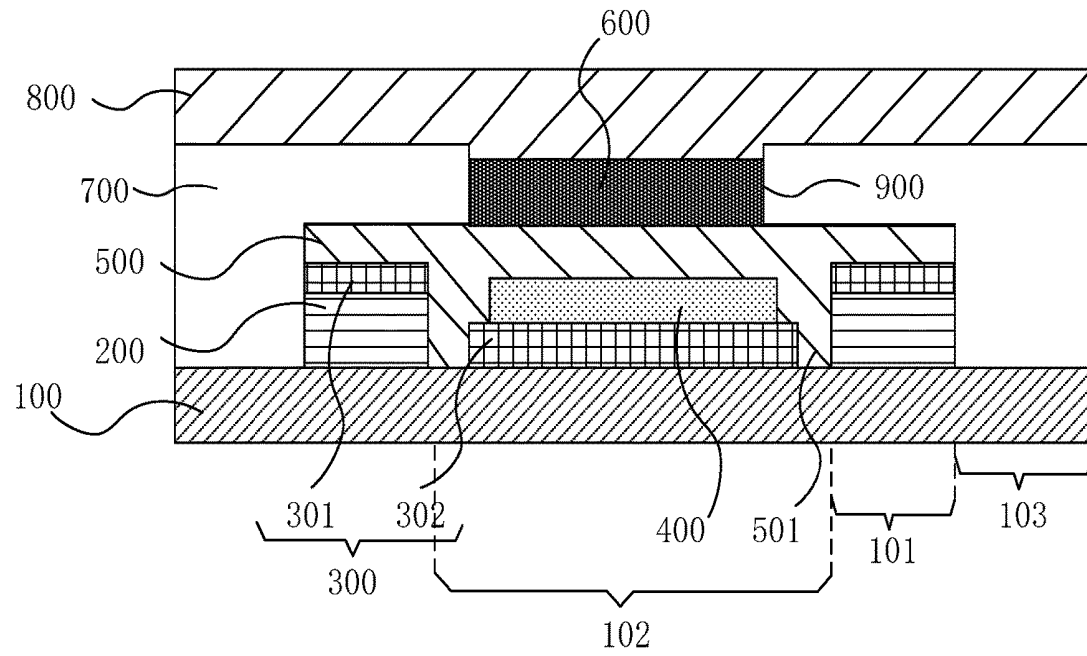


FIG. 4

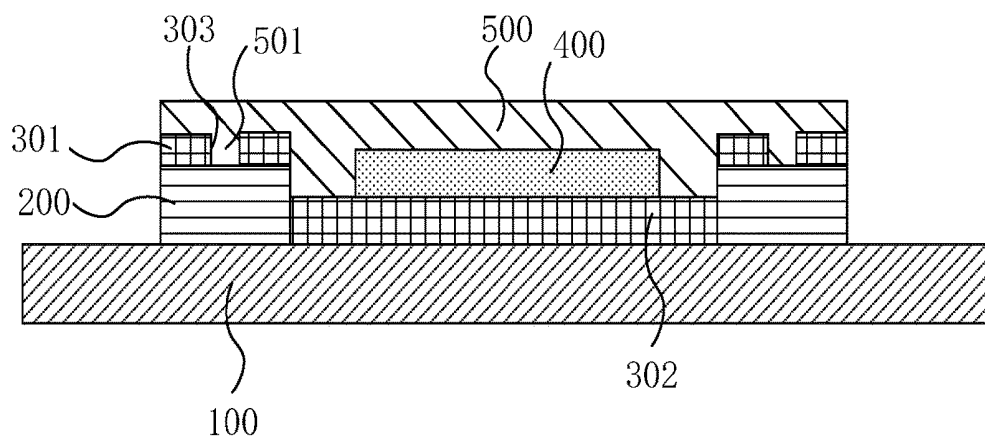


FIG. 5

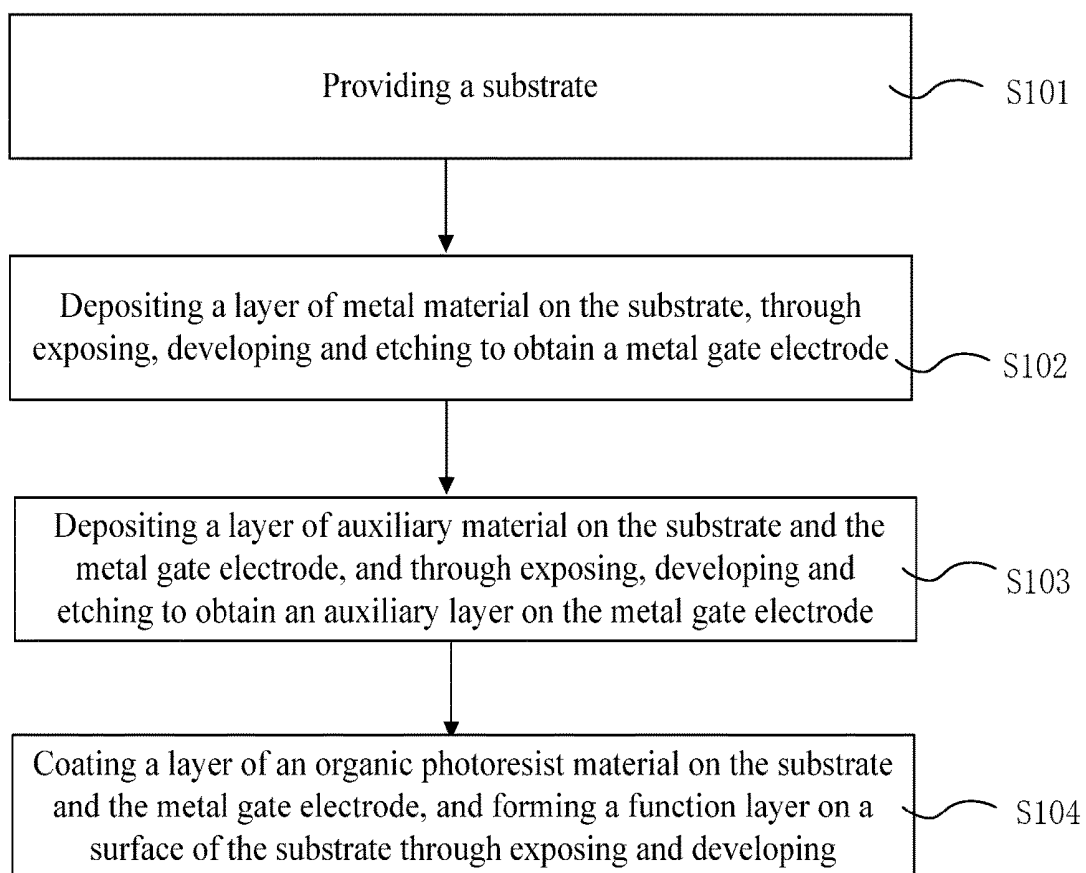


FIG.6

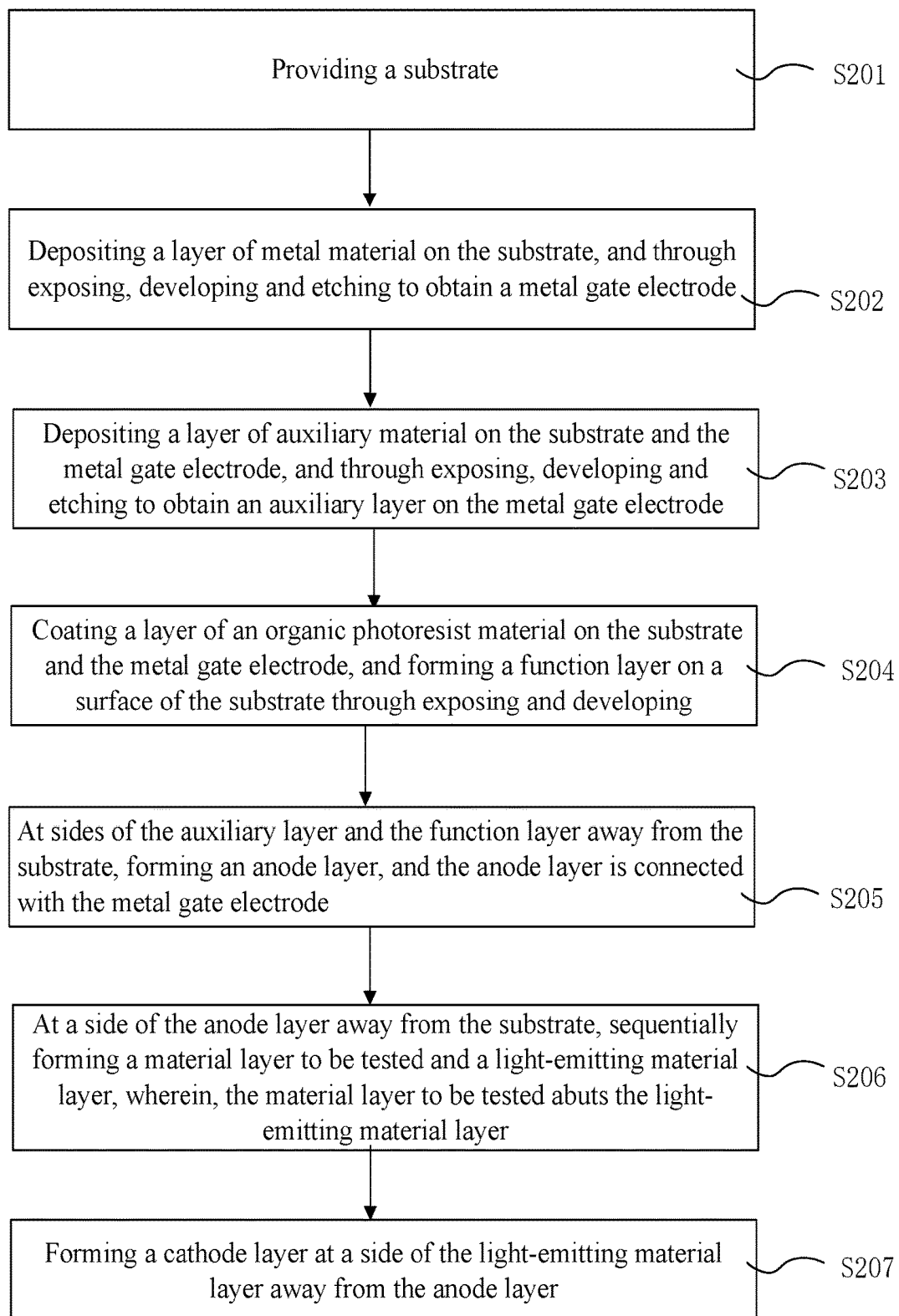


FIG.7

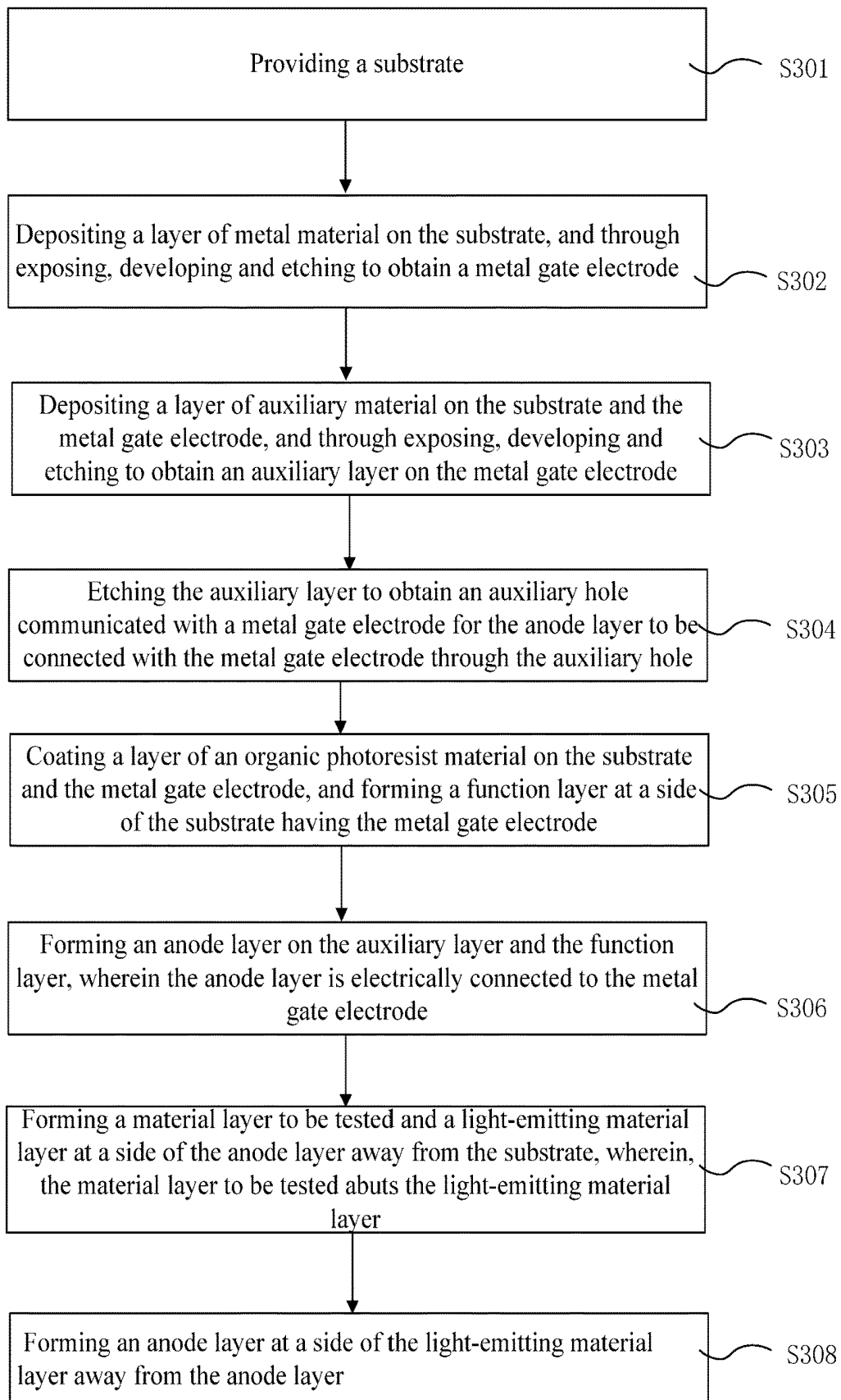


FIG.8

1

# MATERIAL PROPERTY TESTING DEVICE AND MANUFACTURING METHOD FOR THE SAME

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention relates to a material property testing technology, and more particularly to a material property testing device and manufacturing method for the same.

### 2. Description of Related Art

The LED (Light-Emitting Diode) has been widely applied in many industries. Along with the development of the technology, the OLED (Organic Light-Emitting Diode) and the WOLED (White Organic Light-Emitting Diode) appear successively. Currently, the LED, OLED and WOLED have been widely applied in many industries including indication light or applied in desk lamp, TV, display panel, and monitor. Therefore, the luminous effect of the LED is very important.

In the manufacturing process of LED, OLED and WOLED, a pixel definition material is required. The performance of the material directly affects the luminous effect of the LED, OLED and WOLED, specifically, the oxygen content and water content of the material. Therefore, the pixel definition material applied in the LED, OLED and WOLED is required to be tested.

In the process for manufacturing a material property testing device, a metal gate electrode is firstly formed through exposing, developing and etching. Then, through exposing and developing to form a color filter layer and/or an insulation layer on the substrate in order to cooperate to test the pixel definition material. In the formation process of the color filter layer and/or insulation layer, an organic photoresist is required to be coated on the substrate and the metal gate electrode in order to form a film. Then, through exposing and developing to remove the extra organic photoresist on the metal gate electrode and the substrate in order to leave a useful portion to form the color filter layer and/or the insulation layer. Because the adhesion force of the organic photoresist on the metal is poor, the organic photoresist film is usually broken. Accordingly, an uniformity of the organic photoresist film is affected such that the pattern of the color filter layer and/or the insulation layer formed after exposing and developing is not ideal, and greatly affecting the testing effect of the testing device.

## SUMMARY OF THE INVENTION

To improve the poor adhesion force of the organic photoresist on the metal gate electrode of the conventional material testing device, and bad pattern of the color filter layer and/or the insulation layer after exposing and developing, the present invention provides a material property testing device and manufacturing method for the same.

The present invention provides a material property testing device for testing a property of a material, comprising: a substrate; a metal gate electrode disposed at a side of the substrate; an auxiliary layer disposed at a side of the metal gate electrode away from the substrate, wherein, the auxiliary layer includes a first body and a second body, the first body is disposed on the side of the metal gate electrode away from the substrate, and the second body is disposed on a side of the substrate having the metal gate electrode; and a

2

function layer including a color filter layer and being disposed on the side of the substrate having the metal gate electrode, the second body is located between the function layer and substrate, in the formation process of the function layer, an organic photoresist is attached on the auxiliary layer for a period of time, and the function layer is used for cooperating with a light-emitting device to test the property of the material.

The present invention also provides a manufacturing method for a material property testing device, comprising steps of: providing a substrate; depositing a layer of metal material on the substrate, through exposing, developing and etching to obtain a metal gate electrode; depositing a layer of auxiliary material on the substrate and the metal gate electrode, through exposing, developing and etching to obtain an auxiliary layer on the metal gate electrode; and coating a layer of an organic photoresist material on the substrate and the metal gate electrode, and forming a function layer on a side of the substrate having the metal gate electrode through exposing and developing.

The material property testing device and manufacturing method for the same of the present invention forms an auxiliary layer on the surface of the metal gate electrode, and the auxiliary layer is a nonmetallic material. Therefore, in the process of manufacturing the function layer, the organic photoresist is deposited on the substrate and the auxiliary layer. Because the adhesion force of the organic photoresist on the auxiliary layer is strong, the organic photoresist film being deposited is even, a function layer having an ideal pattern is obtained so as to ensure the testing effect of the material property testing device.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram of a material property testing device according to an embodiment of the present invention;

FIG. 2 is a schematic diagram of a material property testing device according to another embodiment of the present invention;

FIG. 3 is a schematic diagram of a material property testing device according to another embodiment of the present invention;

FIG. 4 is a schematic diagram of a material property testing device according to another embodiment of the present invention;

FIG. 5 is a schematic diagram of an auxiliary hole according to an embodiment of the present invention;

FIG. 6 is a flow chart of a manufacturing method for a material property testing device according to an embodiment of the present invention;

FIG. 7 is a flow chart of a manufacturing method for a material property testing device according to another embodiment of the present invention; and

FIG. 8 is a flow chart of a manufacturing method for a material property testing device according to another embodiment of the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The following will combine the figures to describe a material property testing device and a manufacturing method for the same in detail.

With reference to FIG. 1, and FIG. 1 is a schematic diagram of a material property testing device according to an embodiment of the present invention. The material property



testing device includes a substrate **100**, a metal gate electrode **200** disposed at a side of the substrate **100**, an auxiliary layer **300** disposed at a side of the metal gate electrode **200** away from the substrate **100**, and a function layer **400** disposed at a side of the substrate **100** having the metal gate electrode **200**.

Specifically, the metal gate electrode **200** is located between the substrate **100** and the auxiliary layer **300**. The metal gate electrode **200** is used for electrically connecting another part. The function layer **400** is made of an organic photoresist material for cooperating with a light-emitting device to test a property of a material. In the formation process of the function layer **400**, the organic photoresist is attached on the auxiliary layer **300** for a period of time.

Specifically, the process that the function layer **400** is formed on the substrate **100** is: the organic photoresist is coated on the substrate **100** and the auxiliary layer **300**; then, through different exposure amount, removing an excess portion of the organic photoresist on the metal gate electrode **200** and the substrate **100** in order to remain an useful pattern to form the function layer **400**. As shown in FIG. 1, in the above solution, in the formation process of the function layer **400**, at the location of the metal gate electrode **200**, the organic photoresist is coated on the auxiliary layer **300**, and the organic photoresist is not directly contacted with the metal gate electrode **200**. Because an adhesion force of the organic photoresist on the auxiliary layer **300** is strong, a film of the organic photoresist being disposed is even such that after exposing and developing, the function layer **400** having an ideal pattern is obtained so as to ensure the testing effect of the material property testing device.

Preferably, the metal gate electrode **200** is located on the substrate **100** and located closed to an edge of the substrate **100**, and the function layer **400** is located at a middle of the substrate **100**.

Preferably, the substrate **100** can be a transparent glass substrate or a quartz substrate.

It can be understood that the auxiliary layer **300** is a non-metallic layer. Preferably, the auxiliary layer can be SiNx or SiOx with a single layer, or a mixture of SiNx and SiOx, or one layer of SiNx and a combination of one layer of SiOx and one layer of SiOx.

With reference to FIG. 2, in one embodiment, the auxiliary layer **300** includes a first body **301** and a second body **302**. The first body **301** is disposed on a side of the metal gate electrode **200** away from the substrate **100**, and the second body **302** is disposed on a side of the substrate **100** having the metal gate electrode **200**. The second body **302** is located between the function layer **400** and substrate **100**. Because an adhesion force of the organic photoresist on the auxiliary layer **300** is strong, the second body **302** disposed on the substrate **100** can ensure that in the forming process of the function layer, the organic photoresist can be evenly coated such that the function layer **400** having an ideal pattern is obtained so as to ensure the testing effect of the material property testing device.

The operation principle of the material property testing device in testing the material is: forming a material to be tested in the material property testing device, and connecting the material to be tested with a light-emitting device. The light-emitting device emits light to the substrate **100**. If the luminous effect is ideal (mainly considering the color, brightness and clarity of the emitting effect), the property of the material to be tested is good.

With reference to FIG. 3, preferably, the function layer **400** includes a color filter layer **401**. The color filter layer **401** mainly has a light filtering function. If a light emitted

from the light-emitting device is white such as a WOLED, the color filter layer **401** is required to cooperate with the light-emitting device such that through the color filter layer **401**, the white light is decomposed into a color light in order to observe the luminous effect. Specifically, the color filter layer **401** is made of acrylic resin.

In another embodiment, the function layer **400** further includes an insulation layer **402**, the color filter layer **401** is located between the substrate **100** and the insulation layer **402**. The insulation layer **402** has an insulation and isolation function. In a normal situation, if the color filter layer **401** is connected with a part that is connected with the metal gate electrode **200**, the filtering effect of the color filter layer **401** will be affected, and an operation process of the part connected with the metal gate electrode **200** will also be affected. Accordingly, disposing the insulation layer **402** on the color filter layer **401** can ensure that the operation performance of the part connected with the metal gate electrode **200** and the color filter layer **401** can work properly. Preferably, the insulation layer **402** is made of polyimide and/or acrylic material.

With reference to FIG. 4, in one embodiment, the material property testing device further includes an anode layer **500**, a material layer to be tested **700**, a light-emitting material layer **600** and a cathode layer **800**. Wherein, the anode layer **500** is electrically connected to the metal gate electrode **200**. The material layer to be tested **700** is located between the anode layer **500** and the cathode layer **800**. Besides, the material layer to be tested **700**, the anode layer **500** and the cathode layer **800** commonly form a cavity **900** for receiving the light-emitting material layer **600**. The light-emitting material layer **600** is received in the cavity **900**, and the light-emitting material layer **600** abuts the material layer to be tested **700**. The following will describe the operation principle of the material property testing device in the present embodiment. The metal gate electrode **200** is connected with an external power source (not shown in the figure). Then the power is delivered to the anode layer **500** such that between the anode layer **500** and the cathode layer **800**, a voltage difference is formed and the voltage difference is applied on the light-emitting material layer **600** so that the light-emitting material layer **600** emits a light, and the light acts on the substrate **100** in order to observe the light-emitting effect. Because the material layer to be tested **700** abuts the light-emitting material layer **600**, the material layer to be tested **700** will directly affect the luminous effect of the light-emitting material layer **600**. Accordingly, from the luminous effect of the light-emitting material layer **600**, the property of the material layer to be tested **700** is inspected.

In the present embodiment, the metal gate electrode **200** is divided into two pieces. On the substrate **100**, the substrate **100** is divided into a metal region **101**, a middle region **102** and a peripheral region **103**. The function layer **400** is also formed on the substrate **100**, and located at the middle region **102** between two pieces of metal gate electrode **200**. The anode layer **500** is located at the metal region **101** and the middle region **102**, and the anode layer **500** covers the auxiliary layer **300**, a portion of the substrate **100** at the middle region **102** and the function layer **400**. The light-emitting layer **600** is located at the middle region **102** and is formed in the anode layer **500**. The cathode layer **800** is located at the metal region **101**, the middle region **102** and the peripheral region **103**. The light-emitting layer **600** is located between the anode layer **500** and the cathode layer **800**. The material layer to be tested **700** is located at the peripheral region **103**, the metal region **101** and a portion of

the middle region 102. At the peripheral region 103, the material to be tested 700 is located between the substrate 100 and the cathode layer 800. At the metal region 101 and a portion of the middle region 102, the material layer to be tested 700 is located between the anode layer 500 and the cathode layer 800. The above structure can ensure that an exterior structure of the product to be tidy in order to simplify the manufacturing process. It can be understood that in another embodiment, the cathode layer 800 can only be formed at the middle region 102, the only requirement is to ensure that between the anode layer 500 and the cathode layer 800, a voltage difference can be formed to provide to the light-emitting material 600. In another embodiment, at least a portion of the material layer to be tested 700 is formed between the cathode layer 800 and the anode layer 500, and abuts the light-emitting material layer 600.

Specifically, at the anode layer 500, an extension body 501 is provided to be electrically connected to the metal gate electrode 200. In the present embodiment, the extension body 501 is connected with a side surface of the metal gate electrode 200. At this time, the auxiliary layer 300 only includes a first body 301 disposed above the metal gate electrode 200, or the second body 302 disconnected with the first body 301 in order to leave a space at the side of the metal gate electrode 200 for receiving the extension body 501 of the anode layer 500 in order to realize an electric connection between the anode layer 500 and the metal gate electrode 200.

With reference to FIG. 5, in another embodiment, the first body 301 is provided with an auxiliary hole 303 communicating with the metal gate electrode 200. The extension body 501 abuts the metal gate electrode 200 through the auxiliary hole 303 in order to realize an electric connection between the anode layer 500 and the metal gate electrode 200.

In the material property testing device of the present invention, through forming the auxiliary layer 300 on the metal gate electrode 200, in the forming process of subsequent function layer 400, at the location of the metal gate electrode 200, the organic photoresist is coated on the auxiliary layer 300, and the organic photoresist is not directly contacted with the metal gate electrode 200. Because an adhesion force of the organic photoresist on the auxiliary layer 300 is strong, a film of the organic photoresist being disposed is even such that after exposing and developing, the function layer 400 having an ideal pattern is obtained so as to ensure the testing effect of the material property testing device.

The present invention also provides with a manufacturing method for a material property testing device.

With reference to FIG. 6 and FIG. 1, and FIG. 6 is a flow chart of a manufacturing method for a material property testing device according to an embodiment of the present invention. The method includes:

S101: providing a substrate 100.

Preferably, the substrate 100 can be a transparent glass substrate or a quartz substrate.

S102: depositing a layer of metal material on the substrate 100, through exposing, developing and etching to obtain a metal gate electrode 200.

Wherein, the step of depositing a layer of metal material on the substrate 100 usually adopts a physical deposition or a chemical deposition. Then, coating a layer of photoresist on the metal material layer. Then, according to different exposure amount, through exposing and developing, a photoresist having a size equal to the metal gate electrode is adhered on the metal material, and a surface of the other portion of metal material to be removed is exposed. Then,

through etching process to etch the metal material having exposed surface. The metal material protected by the photoresist is remained to form the metal gate electrode 200.

S103: depositing a layer of auxiliary material on the substrate 100 and the metal gate electrode 200, and through exposing, developing and etching to obtain an auxiliary layer 300 on the metal gate electrode 200.

The process of depositing, exposing, developing and etching is the same as the process of forming the metal gate electrode 200, no more repeating. Wherein, the auxiliary layer 300 can only form on the metal gate electrode 200, or include a portion that forms in the substrate 100 and located at a side of the metal gate electrode 200.

S104: coating a layer of an organic photoresist material on the substrate 100 and the metal gate electrode 200, and forming a function layer 400 on a surface of the substrate 100 through exposing and developing.

Wherein, the organic photoresist material is similar to a photoresist used in the step S101. The organic photoresist material is coated on the substrate 100 and the metal gate electrode 200. Then, according to the pattern of the function layer, setting different exposure amount. Then, through exposing and developing, the organic photoresist on the metal gate electrode and other unwanted organic photoresist are removed in order to obtain the function layer having a specific pattern. Specifically, the function layer 400 is a color filter layer for cooperating with a light-emitting device to test a property of a material or including a color filter layer and insulation layer.

Comparing with the conventional art, in the material property testing device obtained by the manufacturing method of the present embodiment, and in the manufacturing process, through forming the auxiliary layer 300 on the metal gate electrode 200, in the forming process of the function layer 400 in the step S104, at the location of the metal gate electrode 200, the organic photoresist is coated on the auxiliary layer 300, and the organic photoresist is not directly contacted with the metal gate electrode 200. Because an adhesion force of the organic photoresist on the auxiliary layer 300 is strong, a film of the organic photoresist being disposed is even such that after exposing and developing, the function layer 400 having an ideal pattern is obtained so as to ensure the testing effect of the material property testing device.

With reference to FIG. 7 and FIG. 4, and FIG. 7 is a flow chart of a manufacturing method for a material property testing device according to another embodiment of the present invention. The method includes:

S201: providing a substrate 100.

S202: depositing a layer of metal material on the substrate 100, through exposing, developing and etching to obtain a metal gate electrode 200.

S203: depositing a layer of auxiliary material on the substrate 100 and the metal gate electrode 200, and through exposing, developing and etching to obtain an auxiliary layer 300 on the metal gate electrode 200.

S204: coating a layer of an organic photoresist material on the substrate 100 and the metal gate electrode 200, and forming a function layer 400 on a surface of the substrate 100 through exposing and developing.

S205: at sides of the auxiliary layer 300 and the function layer 400 away from the substrate 100, forming an anode layer 500, and the anode layer 500 is connected with the metal gate electrode 200.

Wherein, the formation process of the anode layer 500 is the same as the formation process of the metal gate electrode 200, no more repeating.

**S206:** at a side of the anode layer **500** away from the substrate **100**, sequentially forming a material layer to be tested **700** and a light-emitting material layer **600**, wherein, the material layer to be tested **700** abuts the light-emitting material layer **600**.

Wherein, the material layer to be tested **700** is formed through depositing, exposing, developing and etching. Specifically, depositing a material to be tested on the anode layer **500** first. After exposing and developing, etching at least a portion of the material to be tested on the anode layer **500** in order to reveal the anode layer **500** for evaporating the light-emitting material layer **600**. Or, evaporating the light-emitting material layer **600** on the anode layer **500** first, then, depositing the material to be tested on the anode layer **500** and the light-emitting material layer **600**. Finally, etching the material to be tested corresponding to the light-emitting material layer **600** in order to prepare for a step **S207**.

**S207:** forming a cathode layer **800** at a side of the light-emitting material layer **600** away from the anode layer **500**.

Evaporating the light-emitting material layer **600** on the cathode layer **800** through an evaporation method. In another embodiment, the cathode layer **800** can be evaporated to be extended outside a region corresponding to the light-emitting material layer **600**. For example, extending to be on the material layer to be tested **700** so that an exterior structure of the entire device is smoother.

With reference to FIG. 8, FIG. 4 and FIG. 5, and FIG. 8 is a flow chart of a manufacturing method for a material property testing device according to another embodiment of the present invention. The method includes:

**S301:** providing a substrate **100**.

**S302:** depositing a layer of metal material on the substrate **100**, through exposing, developing and etching to obtain a metal gate electrode **200**.

**S303:** depositing a layer of auxiliary material on the substrate **100** and the metal gate electrode **200**, and through exposing, developing and etching to obtain an auxiliary layer **300** on the metal gate electrode **200**.

**S304:** etching the auxiliary layer **300** to obtain an auxiliary hole **303** communicated with a metal gate electrode **200** for the anode layer **500** to be connected with the metal gate electrode **200** through the auxiliary hole **303**.

In another embodiment, the step of etching the auxiliary layer **300** to obtain an auxiliary hole **303** communicated with a metal gate electrode **200** can be performed after a step of forming a function layer **400**. The only requirement is that the above step should be finished before a step **S306** for forming an anode layer **500**. It can be understood that in another embodiment, the auxiliary hole **303** is not necessary, but leaving a spacing at a side surface of the metal gate electrode **200** for filling the anode layer **500** in the disposition process of the anode layer **500** in order to realize an electric connection between the anode layer **500** and the metal gate electrode **200**. Specifically, the spacing can be formed between the side surface of the metal gate electrode **200** and the function layer **400**. Or, when the auxiliary layer **300** includes the second body **302** covering on the substrate, the auxiliary hole **303** is etched to be located at a side surface of the metal gate electrode **200** and be located on the second body **302**. After the auxiliary hole **303** is formed, the side surface of the metal gate electrode **200** is revealed. That is, using a side surface of the metal gate electrode **200** as an inner wall of the auxiliary hole **303**.

**S305:** coating a layer of an organic photoresist material on the substrate **100** and the metal gate electrode **200**, and forming a function layer **400** at a side of the substrate having the metal gate electrode **200**.

**S306:** forming an anode layer **500** on the auxiliary layer **300** and the function layer **400**, wherein the anode layer **500** is electrically connected to the metal gate electrode **200**.

In the present embodiment, the material for manufacturing the anode layer **500** is filled in the auxiliary hole **303** in order to realize an electric connection between the anode layer **500** and the metal gate electrode **200**.

**S307:** forming a material layer to be tested **700** and a light-emitting material layer **600** at a side of the anode layer **500** away from the substrate **100**, wherein, the material layer to be tested **700** abuts the light-emitting material layer **600**.

**S308:** forming an anode layer **800** at a side of the light-emitting material layer **600** away from the anode layer **500**.

The above embodiments of the present invention are not used to limit the claims of this invention. Any use of the content in the specification or in the drawings of the present invention which produces equivalent structures or equivalent processes, or directly or indirectly used in other related technical fields is still covered by the claims in the present invention.

What is claimed is:

1. A material property testing device for testing a property of a material, comprising:

a substrate;

a metal gate electrode disposed at a side of the substrate; an auxiliary layer disposed at a side of the metal gate electrode away from the substrate, wherein, the auxiliary layer includes a first body and a second body, the first body is disposed on the side of the metal gate electrode away from the substrate, and the second body is disposed on a side of the substrate having the metal gate electrode; and

a function layer including a color filter layer and being disposed on the side of the substrate having the metal gate electrode, the second body is located between the function layer and substrate, in the formation process of the function layer, an organic photoresist is attached on the auxiliary layer for a period of time, and the function layer is used for cooperating with a light-emitting device to test the property of the material.

2. The material property testing device according to claim 1, wherein, the color filter layer is made of acrylic resin.

3. The material property testing device according to claim 1, wherein, the function layer further includes an insulation layer, the color filter layer is disposed between the substrate and the insulation layer.

4. The material property testing device according to claim 1, wherein, the device further includes an anode layer, a material layer to be tested, a light-emitting material layer and a cathode layer, wherein, the anode layer is electrically connected to the metal gate electrode, the material layer to be tested is located between the anode layer and the cathode layer, the material layer to be tested, the anode layer and the cathode layer form a cavity for receiving the light-emitting material layer, the light-emitting material layer is received in the cavity, and the light-emitting material layer abuts the material layer to be tested.

5. A material property testing device for testing a property of a material, comprising:

a substrate;

a metal gate electrode disposed at a side of the substrate;

9

an auxiliary layer disposed at a side of the metal gate electrode away from the substrate; and

a function layer including an organic photoresist and being disposed on the side of the substrate having the metal gate electrode, in the formation process of the function layer, the organic photoresist is attached on the auxiliary layer for a period of time, and the function layer is used for cooperating with a light-emitting device to test the property of the material;

wherein the function layer includes a color filter layer.

6. The material property testing device according to claim 5, wherein, the auxiliary layer includes a first body and a second body, the first body is disposed on the side of the metal gate electrode away from the substrate, and the second body is located between the function layer and the substrate.

7. The material property testing device according to claim 5, wherein, the color filter layer is made of acrylic resin.

8. The material property testing device according to claim 5, wherein, the function layer further includes an insulation layer, the color filter layer is disposed between the substrate and the insulation layer.

9. The material property testing device according to claim 5, wherein, the device further includes an anode layer, a material layer to be tested, a light-emitting material layer and a cathode layer, wherein, the anode layer is electrically connected to the metal gate electrode, the material layer to be tested is located between the anode layer and the cathode layer, the material layer to be tested, the anode layer and the cathode layer form a cavity for receiving the light-emitting material layer, the light-emitting material layer is received in the cavity, and the light-emitting material layer abuts the material layer to be tested.

10. The material property testing device according to claim 9, wherein, the auxiliary layer is provided with at least one auxiliary hole communicating with the metal gate

10

electrode, and the anode layer is electrically connected to the metal gate electrode through the auxiliary hole.

11. A manufacturing method for a material property testing device, comprising steps of:

providing a substrate;

depositing a layer of metal material on the substrate, through exposing, developing and etching to obtain a metal gate electrode;

depositing a layer of auxiliary material on the substrate and the metal gate electrode, through exposing, developing and etching to obtain an auxiliary layer on the metal gate electrode;

coating a layer of an organic photoresist material on the substrate and the metal gate electrode, and forming a function layer on a side of the substrate having the metal gate electrode through exposing and developing;

at sides of the auxiliary layer and the function layer away from the substrate, forming an anode layer, and the anode layer is electrically connected with the metal gate electrode;

at a side of the anode layer away from the substrate, sequentially forming a material layer to be tested and a light-emitting material layer, wherein, the material layer to be tested abuts the light-emitting material layer; and

forming a cathode layer at a side of the light-emitting material layer away from the anode layer.

12. The manufacturing method for a material property testing device according to claim 11, wherein, before the step of at sides of the auxiliary layer and the function layer away from the substrate, forming an anode layer, the method further comprises a step of etching the auxiliary layer to obtain an auxiliary hole communicated with a metal gate electrode for the anode layer to be connected with the metal gate electrode through the auxiliary hole.

\* \* \* \* \*

专利名称(译)	材料性能测试装置及其制造方法		
公开(公告)号	<a href="#">US10305039</a>	公开(公告)日	2019-05-28
申请号	US15/556065	申请日	2017-07-21
[标]发明人	LI SONGSHAN		
发明人	LI, SONGSHAN		
IPC分类号	H01L51/00 G01N21/25 H01L51/56 H01L27/32		
CPC分类号	H01L51/0031 G01N21/255 H01L27/322 H01L27/3248 H01L51/0018 H01L51/56 H01L27/3246 G01N2201/0621		
代理机构(译)	程, ANDREW C.		
优先权	201710509495.4 2017-06-28 CN		
其他公开文献	US20190006594A1		
外部链接	<a href="#">Espacenet</a>		

#### 摘要(译)

公开了一种材料特性测试装置和制造方法。该装置包括：基板；金属栅电极；辅助层设置在金属栅电极上，金属栅电极位于基板和辅助层之间；功能层设置在基板上。在功能层的形成过程中，有机光致抗蚀剂附着在辅助层上一段时间，功能层用于与发光器件配合以测试材料的性质。设置有机光致抗蚀剂的膜是这样的，即在曝光和显影之后，获得具有理想图案的功能层，以确保材料性能测试装置的测试效果。

