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(54) **MICRO LIGHT-EMITTING DIODE ARRAY SUBSTRATE AND DISPLAY PANEL**

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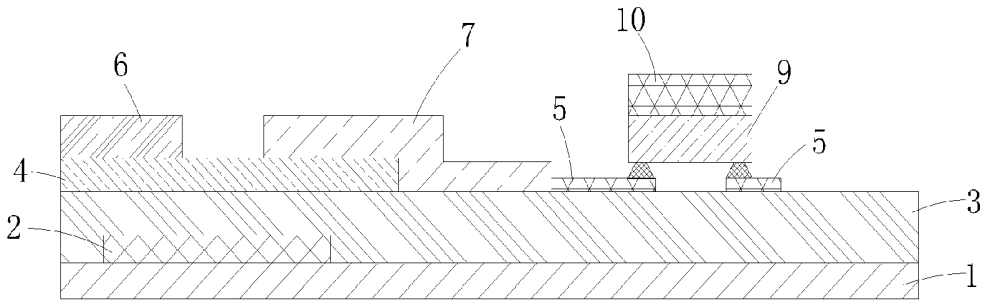
(57) **ABSTRACT**

The disclosure provides a micro light-emitting diode array substrate, including a glass substrate. The glass substrate is formed with a gate electrode and a dielectric layer in sequence. The dielectric layer is formed with a semiconductor layer and a pixel electrode. The semiconductor layer is disposed with a source electrode and a drain electrode. The drain electrode and the adjacent pixel electrode are connected. The pixel electrode is connected with a micro light-emitting diode. The gate electrode, the source electrode, the drain electrode, the pixel electrode and a lead connected with a pin of the micro light-emitting diode are all made out of graphene conductive material. The disclosure further provides a display panel, including the micro LED array substrate. Micro LEDs are respectively disposed with color block layers. Compared with the prior art, heat of the micro light-emitting diodes can be transmitted to other regions for improving heat dissipation.



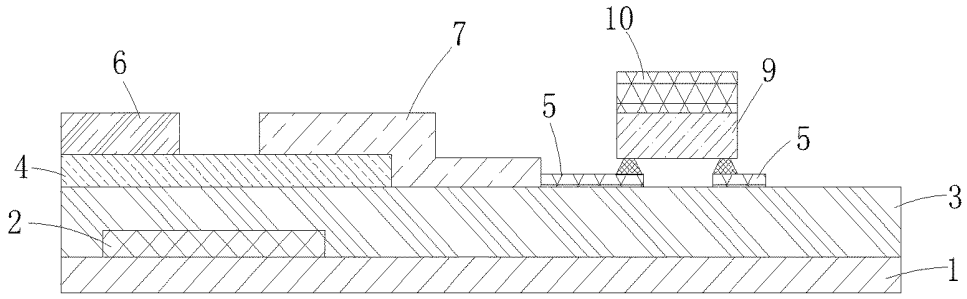


FIG. 1

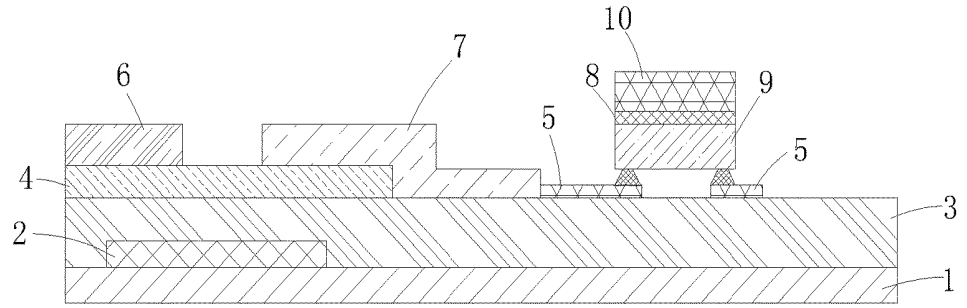


FIG. 2

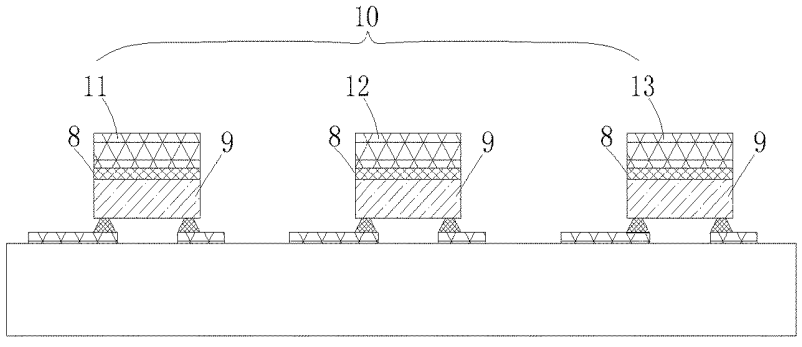


FIG. 3

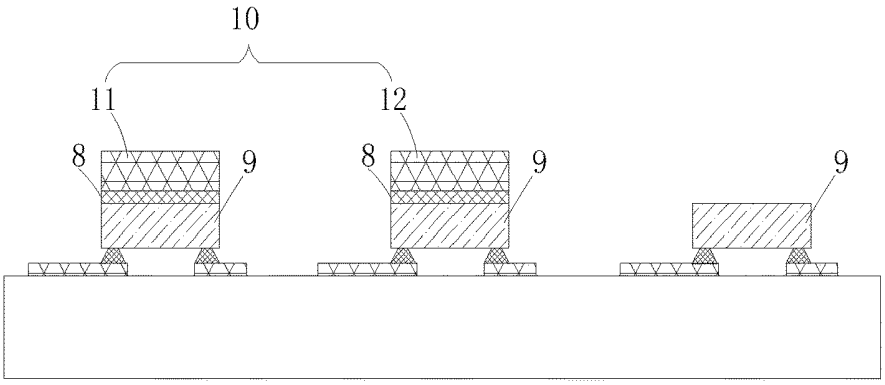


FIG. 4

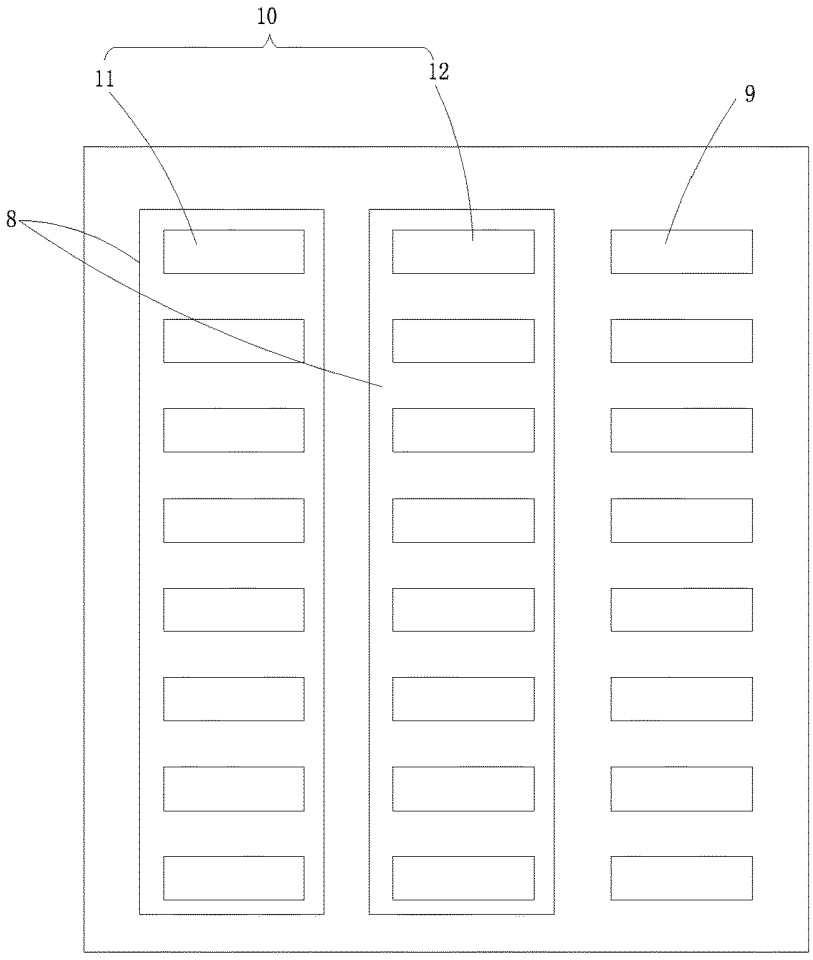


FIG. 5

MICRO LIGHT-EMITTING DIODE ARRAY SUBSTRATE AND DISPLAY PANEL

TECHNICAL FIELD

[0001] The disclosure relates to a micro light-emitting diode display technical field, and more particularly to a micro light-emitting diode array substrate and a display panel.

DESCRIPTION OF RELATED ART

[0002] Panel display devices are widely applied in various consumer electronics such as mobile phones, televisions, personal digital assistants, digital cameras, laptops and computers due to virtues such as high quality, energy saving, a thin body and wide application, which have been the mainstream in the display devices.

[0003] A micro LED (μLED) display is a display using LED arrays with the high density and mini size integrated on a substrate as display pixels to display images. Identically to an outdoor LED screen with a large size, each pixel can address as well as being driven to be lit independently, which can be considered as a smaller version of the outdoor LED screen that reduces distances among pixels from a millimeter scale to a micron scale. The μLED display and the organic light-emitting diode (OLED) display are both self-luminous displays, but the μLED display has advantages such as more stable material, longer life without image brand compared with the OLED display, which is regarded as a major competitor of the OLED display.

[0004] A conventional micro LED display array is a micro LED array structure designed above a driving array. Communicating connection of the array will be drove by positive and negative electrodes. Switch state and brightness of micro LEDs of each pixel are controlled by a TFT array. The density of the micro LEDs will be extremely high during high pixels per inch (PPI) display due to the micro size of the micro LED array, which has a problem of poor heat dissipation. The heat dissipation problem of the micro LED array substrate will influence the display effect on the display region, including variation of the voltage and current according to the temperature, service life reduction of the chip and thermal quenching of the micro LED. When a color block layer is made out of quantum dot (QD) material, the high temperature problem of the micro LED array can easily affect stability of the QD material due to poor thermal resistance of the material.

SUMMARY

[0005] In order to overcome shortcomings of the prior art, the disclosure provides a micro light-emitting diode array substrate and a display panel to enhance heat dissipation.

[0006] The disclosure provides a micro light-emitting diode array substrate, including a glass substrate. The glass substrate is formed with a gate electrode and a dielectric layer in sequence. The dielectric layer is formed with a semiconductor layer and a pixel electrode. The semiconductor layer is disposed with a source electrode and a drain electrode. The drain electrode and the adjacent pixel electrode are connected. The pixel electrode is connected with a micro light-emitting diode. The gate electrode, the source electrode, the drain electrode, the pixel electrode and a lead connected with a pin of the micro light-emitting diode are all made out of graphene conductive material.

[0007] In an embodiment of the disclosure, a surface of the micro light-emitting diode is covered by a heat dissipation layer.

[0008] In an embodiment of the disclosure, the heat dissipation layer is made out of graphene.

[0009] The disclosure further provides a display panel, including the micro light-emitting diode array substrate. The micro light-emitting diodes are disposed with color block layers respectively.

[0010] In an embodiment of the disclosure, heat dissipation layers are disposed between the micro light-emitting diodes and the color block layers.

[0011] In an embodiment of the disclosure, the heat dissipation layers are made out of graphene.

[0012] In an embodiment of the disclosure, the micro light-emitting diodes are blue micro light-emitting diodes. The color block layers include an R color block layer and a G color block layer. The R color block layer and the G color block layer are respectively disposed above the micro light-emitting diodes used as an R subpixel and a G subpixel.

[0013] In an embodiment of the disclosure, the color block layers are made out of quantum dot material.

[0014] In an embodiment of the disclosure, the heat dissipation layers on the R color block layer are mutually connected to form an entirety. The heat dissipation layers on the G color block layer are mutually connected to form an entirety.

[0015] Compared with the prior art, first, the gate electrode, the source electrode, the drain electrode, the pixel electrode and the lead connected with the pin of the micro light-emitting diodes are all made out of graphene conductive material, so that heat of the micro light-emitting diodes can be transmitted to other regions for improving heat dissipation. Second, the heat dissipation layers disposed between the color block layers on the micro light-emitting diodes and the micro light-emitting diodes can further enhance the heat dissipation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] FIG. **1** is a structural schematic view of a first micro light-emitting diode array substrate according to the disclosure.

[0017] FIG. **2** is a structural schematic view of a second micro light-emitting diode array substrate according to the disclosure.

[0018] FIG. **3** is a structural schematic view of a display panel according to the disclosure.

[0019] FIG. **4** is a structural schematic view of another display panel according to the disclosure.

[0020] FIG. **5** is a projection diagram of FIG. **4**.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0021] The disclosure will be described in detail with reference to embodiments and the accompanying drawings as follows.

[0022] As shown in FIG. **1**, a first micro light-emitting diode array substrate of the disclosure includes a glass substrate **1**. The glass substrate **1** is formed with a gate electrode **2** and a dielectric layer **3** in sequence by the conventional technology. The dielectric layer **3** is formed with a semiconductor layer **4** and a pixel electrode **5**. The semiconductor layer **4** is disposed with a source electrode **6**

and a drain electrode **7**. The drain electrode **7** and the adjacent pixel electrode **5** are connected. The pixel electrode **5** is connected with a micro light-emitting diode **9** by transfer printing. The gate electrode **2**, the source electrode **6**, the drain electrode **7**, the pixel electrode **5** and a lead connected with a pin of the micro light-emitting diode **9** are all made out of graphene conductive material.

[0023] The electrode wire and the lead adopt the graphene conductive material to solve the problem of heat dissipation. Heat of the micro LED **9**, the electrode wire and the lead can be transferred.

[0024] A display panel of the disclosure includes the first micro LED array substrate above. The micro LEDs **9** are respectively disposed with color block layers **10**. The color block layers **10** include a red (R) color block layer **11**, a green (G) color block layer **12**, and a blue (B) color block layer **13** to form a pixel.

[0025] As shown in FIG. **2**, a second micro light-emitting diode array substrate includes the glass substrate **1**. The glass substrate **1** is formed with the gate electrode **2** and the dielectric layer **3** in sequence by the conventional technology. The dielectric layer **3** is formed with the semiconductor layer **4** and the pixel electrode **5**. The semiconductor layer **4** is disposed with the source electrode **6** and the drain electrode **7**. The drain electrode **7** and the adjacent pixel electrode **5** are connected. The pixel electrode **5** is connected with the micro light-emitting diode **9** by transfer printing. The gate electrode **2**, the source electrode **6**, the drain electrode **7**, the pixel electrode **5** and a lead connected with a pin of the micro light-emitting diode **9** are all made out of graphene conductive material. The micro LED **9** is covered by a heat dissipation layer **8**. The heat dissipation layer **8** is made out of graphene, which can further improve heat dissipation.

[0026] As shown in FIG. **3**, as a second display panel of the disclosure, except the LEDs **9**, the heat dissipation layers **8** and the color block layers **10**, other components are identical to the counterparts in FIG. **1** or FIG. **2**, which will not be repeated. The heat dissipation layers **8** adopting the second micro LED array substrate are respectively disposed with the color block layers **10**. The color block layers **10** include the red (R) color block layer **11**, the green (G) color block layer **12**, and the blue (B) color block layer **13** to form a pixel. The color block layers **10** are all made out of quantum dot (QD) material. The QD can be called nanocrystal as well, which is a kind of nano particles composed by elements in the II-VI family or III-V family. The diameter of the QD is generally 1-10 nm.

[0027] As the material of the color block layers **10** cannot resist the high temperature, the heat dissipation layers **8** made out of graphene are disposed between the color block layers **10** and the micro LEDs **9**, which can reduce the heat transferred to the color block layers **10**, further preventing influence on the stability of the QD material due to poor heat dissipation. The color block layers **10** can further be replaced by the QD material as a color enhancement layer.

[0028] As shown in FIG. **4**, as a third display panel of the disclosure, the figure merely shows the LEDs **9**, the heat dissipation layers **8**, and the color block layers **10**. The other components are not showed, structures of which are identical to the counterparts in FIG. **1**. Therefore, only the improved components will be illustrated. As the third display panel of the disclosure, based on employing the second micro LED array substrate, when the micro LEDs **9** are blue micro LEDs, the color block layers **10** are disposed above the micro LEDs **9** used as an R subpixel and a G subpixel. The color block layers **10** include the R color block layer **11** and the G color block layer **12**. As the micro LEDs **9** are the blue micro LEDs, no color block layer is required to be disposed above the micro LED **9** used as the B subpixel, which saves the material. The heat dissipation layers **8** are respectively disposed between the R color block layer **11** and the corresponding micro LED **9**, and between the G color block layer **12** and the corresponding micro LED **9**. The heat dissipation layers **8** are made out of graphene. The color block layers **10** are made out of the QD material. The color block layers **10** are gray.

[0029] Obviously, the color of the micro LED in the third display panel is just an example, which is not a limitation. Any conventional color applied in the micro LED can be regarded as a part of the disclosure. For instance, when the micro LED is red, the corresponding micro LED used as the R subpixel is disposed without the color block layer. The B color block layer is disposed on the micro LED used as the B subpixel. The G color block layer is disposed on the micro LED used as the G subpixel. The disposition of adopting the green micro LED is similar, which will not be repeated.

[0030] As shown in FIG. **5**, the heat dissipation layers **8** on the R color block layer **11** are mutually connected to form an entirety to extend the area of the specific heat dissipation layers **8**, which improve the heat dissipation effect. The heat dissipation layers **8** on the G color block layer **12** are mutually connected to form an entirety to extend the area of the specific heat dissipation layers **8**, which improve the heat dissipation effect.

[0031] The color block layers **10** and the heat dissipation layers **8** in the disclosure can be physical contact, which are overlapped mutually, or without contact, the heat dissipation layers are disposed to prevent the high temperature of the micro LEDs from affecting the property of the upper color block layers. The color block layers **10** adopt gray graphene.

[0032] The display panel of the disclosure abandons the conventional CF substrate, and prints the color block layers on the micro LEDs by printing directly. A complex process of producing the CF substrate is unnecessary, which saves the material and reduces costs.

[0033] Although the disclosure is illustrated with reference to specific embodiments, a person skilled in the art should understand that various modifications on forms and details can be achieved within the spirit and scope of the disclosure limited by the claims and the counterpart.

What is claimed is:

1. A micro light-emitting diode array substrate, comprising a glass substrate, the glass substrate formed with a gate electrode and a dielectric layer in sequence, the dielectric layer formed with a semiconductor layer and a pixel electrode, the semiconductor layer disposed with a source electrode and a drain electrode, the drain electrode and the adjacent pixel electrode are connected, the pixel electrode connected with a micro light-emitting diode, the gate electrode, the source electrode, the drain electrode, the pixel electrode and a lead connected with a pin of the micro light-emitting diode made out of graphene conductive material.

2. The micro light-emitting diode array substrate according to claim **1**, wherein a surface of the micro light-emitting diode is covered by a heat dissipation layer.

3. The micro light-emitting diode array substrate according to claim 2, wherein the heat dissipation layer is made out of graphene.

4. A display panel, comprising a micro light-emitting diode array substrate, the micro light-emitting diode array substrate comprising a glass substrate, the glass substrate formed with a gate electrode and a dielectric layer in sequence, the dielectric layer formed with a semiconductor layer and a pixel electrode, the semiconductor layer disposed with a source electrode and a drain electrode, the drain electrode and the adjacent pixel electrode are connected, the pixel electrode connected with micro light-emitting diodes, the gate electrode, the source electrode, the drain electrode, the pixel electrode and a lead connected with a pin of the micro light-emitting diodes made out of graphene conductive material, the micro light-emitting diodes disposed with color block layers respectively.

5. The display panel according to claim 4, wherein heat dissipation layers are disposed between the micro light-emitting diodes and the color block layers.

6. The display panel according to claim 5, wherein the heat dissipation layers are made out of graphene.

7. The display panel according to claim 6, wherein the micro light-emitting diodes are blue micro light-emitting diodes, the color block layers comprise an R color block layer and a G color block layer, the R color block layer and the G color block layer are respectively disposed above the micro light-emitting diodes used as an R subpixel and a G subpixel.

8. The display panel according to claim 7, wherein the color block layers are made out of quantum dot material.

9. The display panel according to claim 7, wherein the heat dissipation layers on the R color block layer are mutually connected to form an entirety; the heat dissipation layers on the G color block layer are mutually connected to form an entirety.

10. The display panel according to claim 8, wherein the heat dissipation layers on the R color block layer are mutually connected to form an entirety; the heat dissipation layers on the G color block layer are mutually connected to form an entirety.

* * * * *

专利名称(译)	微型发光二极管阵列基板和显示板		
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申请(专利权)人(译)	深圳中星光电科技有限公司		
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[标]发明人	CHEN LIXUAN		
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其他公开文献	US10504450		
外部链接	Espacenet USPTO		

摘要(译)

本发明提供一种微发光二极管阵列基板，包括玻璃基板。玻璃基板依次形成有栅电极和电介质层。介电层形成有半导体层和像素电极。半导体层设置有源电极和漏电极。漏电极和相邻的像素电极连接。像素电极与微发光二极管连接。栅电极，源电极，漏电极，像素电极和与微发光二极管的引脚连接的引线均由石墨烯导电材料制成。本发明还提供一种显示面板，包括微型LED阵列基板。微LED分别设置有色块层。与现有技术相比，微发光二极管的热量可以传递到其他区域以改善散热。