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Lee et al.

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(54) **ORGANIC LIGHT EMITTING DIODE DISPLAY DEVICE INCLUDING ANTIREFLECTION LINE**

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H01L 27/32 (2006.01)

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CPC ***H01L 51/52*** (2013.01); ***H01L 27/3276*** (2013.01); ***H01L 33/08*** (2013.01); ***H01L 51/5281*** (2013.01); *H01L 27/322* (2013.01)

(58) **Field of Classification Search**
CPC H01L 51/52; H01L 33/08
USPC 257/40, 59, 72, 762, E29.068, E29.117; 438/104, 155, 151, 283, 754
See application file for complete search history.

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(57) **ABSTRACT**

An organic light emitting diode display device includes: a substrate; a first antireflection line formed on the substrate and including a first metallic layer and a first inorganic layer stacked sequentially; a gate line formed on the first antireflection line; a gate insulation layer formed on the substrate and the gate line; a second antireflection line formed on the gate insulation layer and including a second metallic layer and a second inorganic layer stacked sequentially; a data line formed on the second antireflection line; and wherein the first inorganic layer connects the first metallic layer and the gate line electrically and the second inorganic layer connects the second metallic layer and the data line.

13 Claims, 6 Drawing Sheets

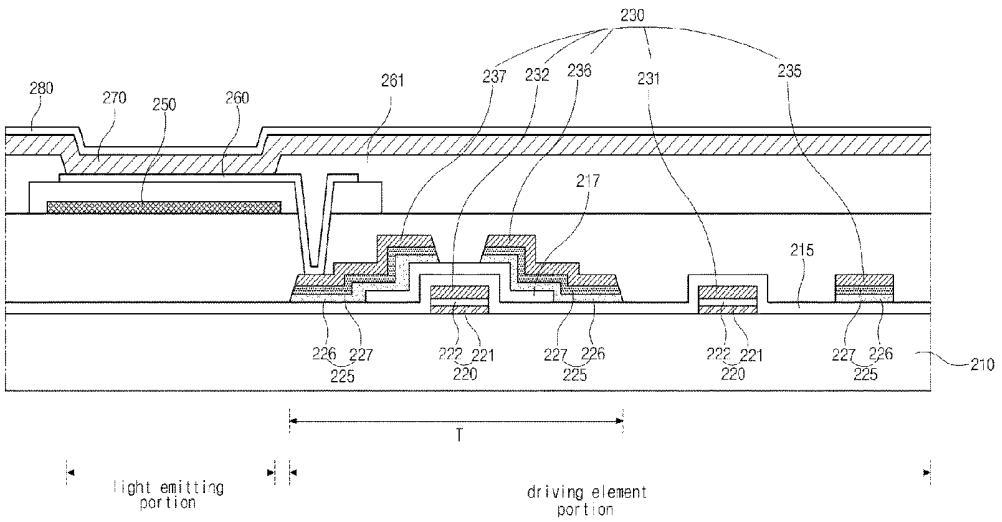

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FIG. 1

Related Art

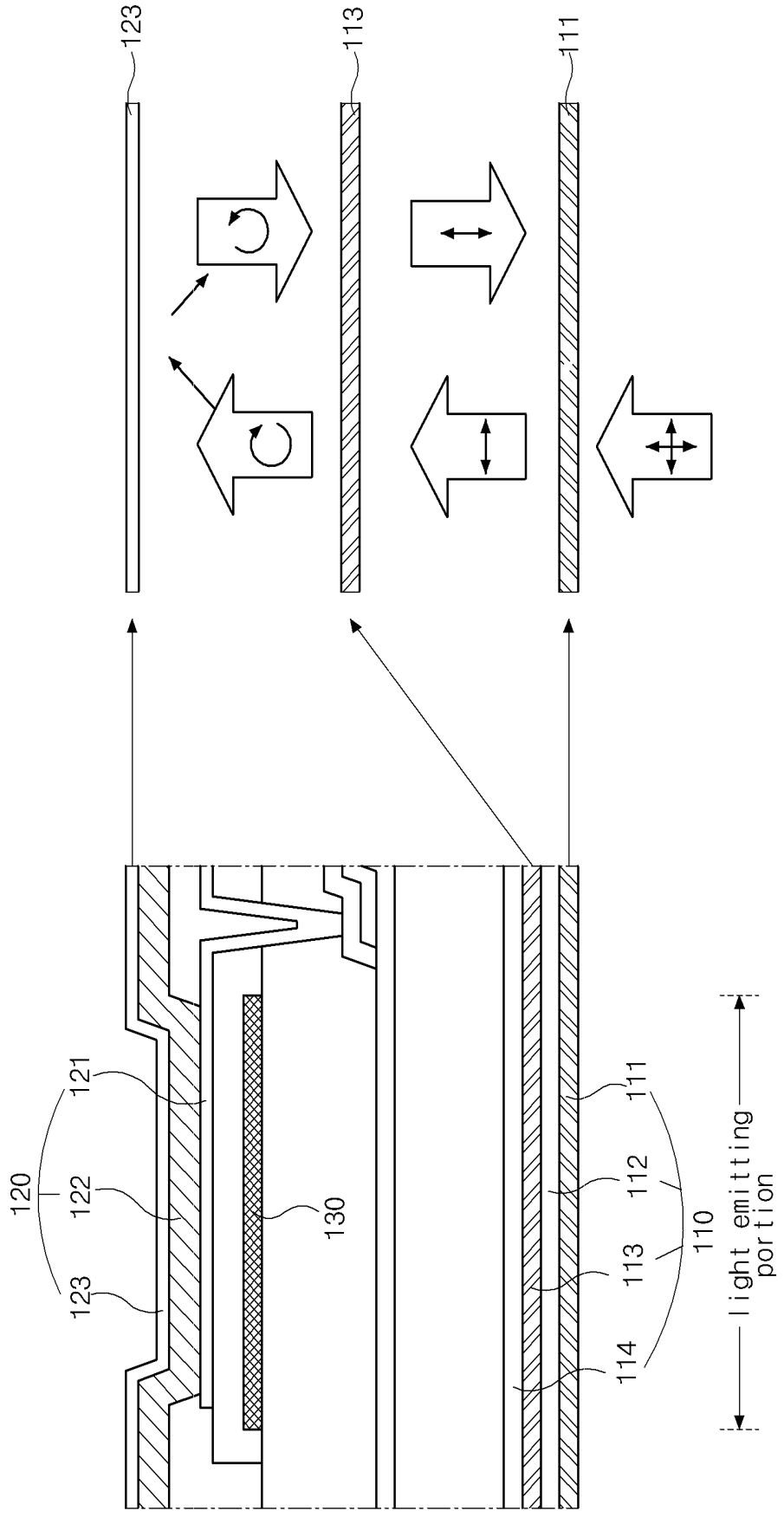


FIG. 2

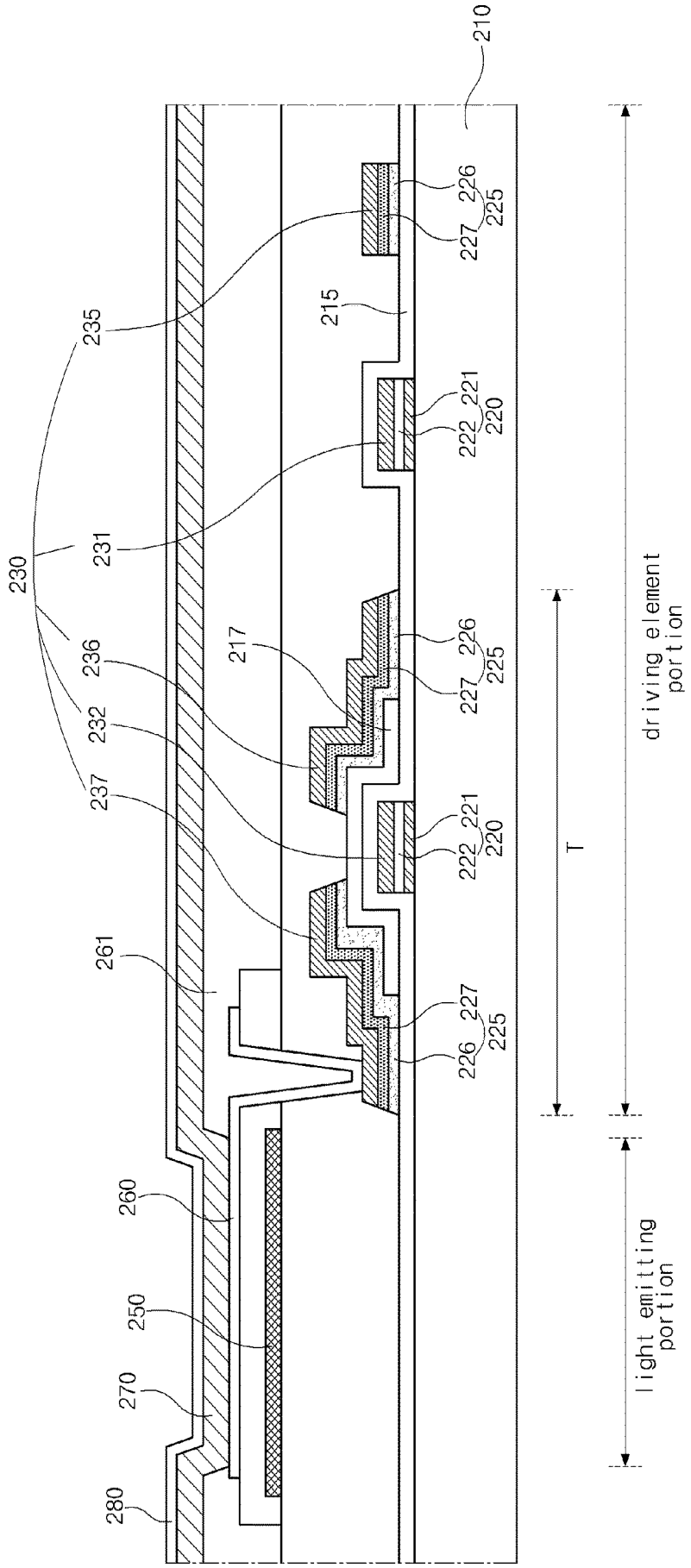

210
226
225
227
215
235
221
220
222
230
231
217
236
232
237
261
T
driving element portion
light emitting portion
260
250
270
280

FIG. 3

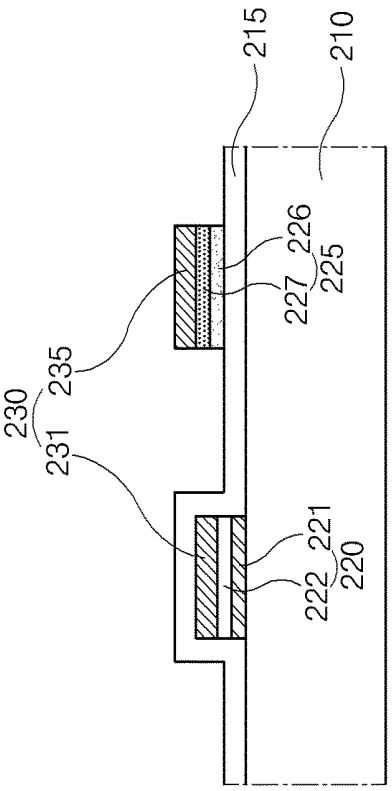

215
210
226
225
227
235
230
231
221
220
222

FIG. 4

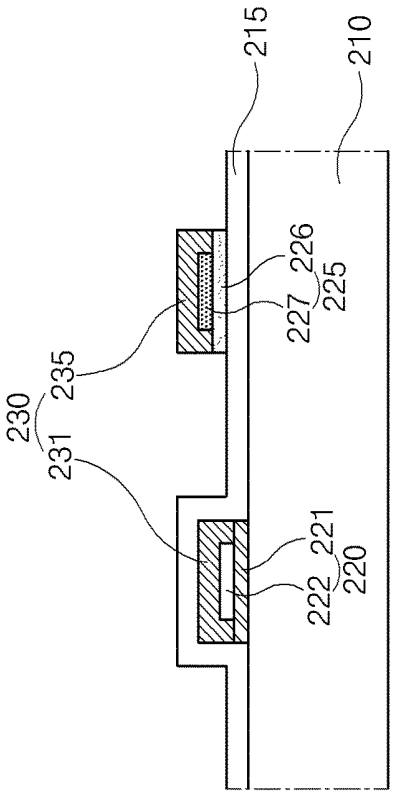

215
210
226
225
227
235
230
231
221
220
222

FIG. 5

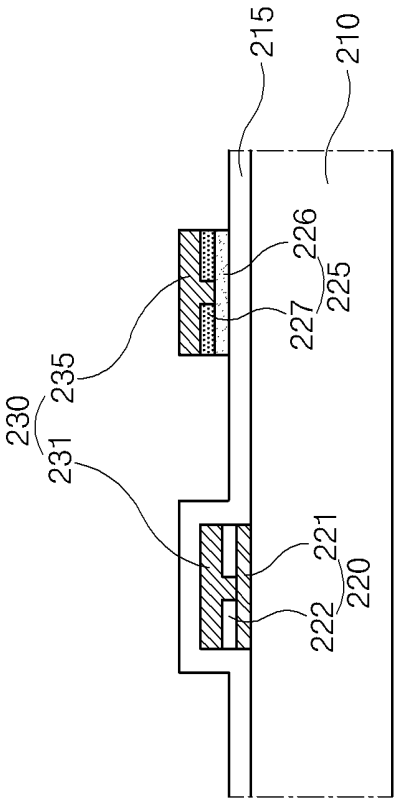


FIG. 6

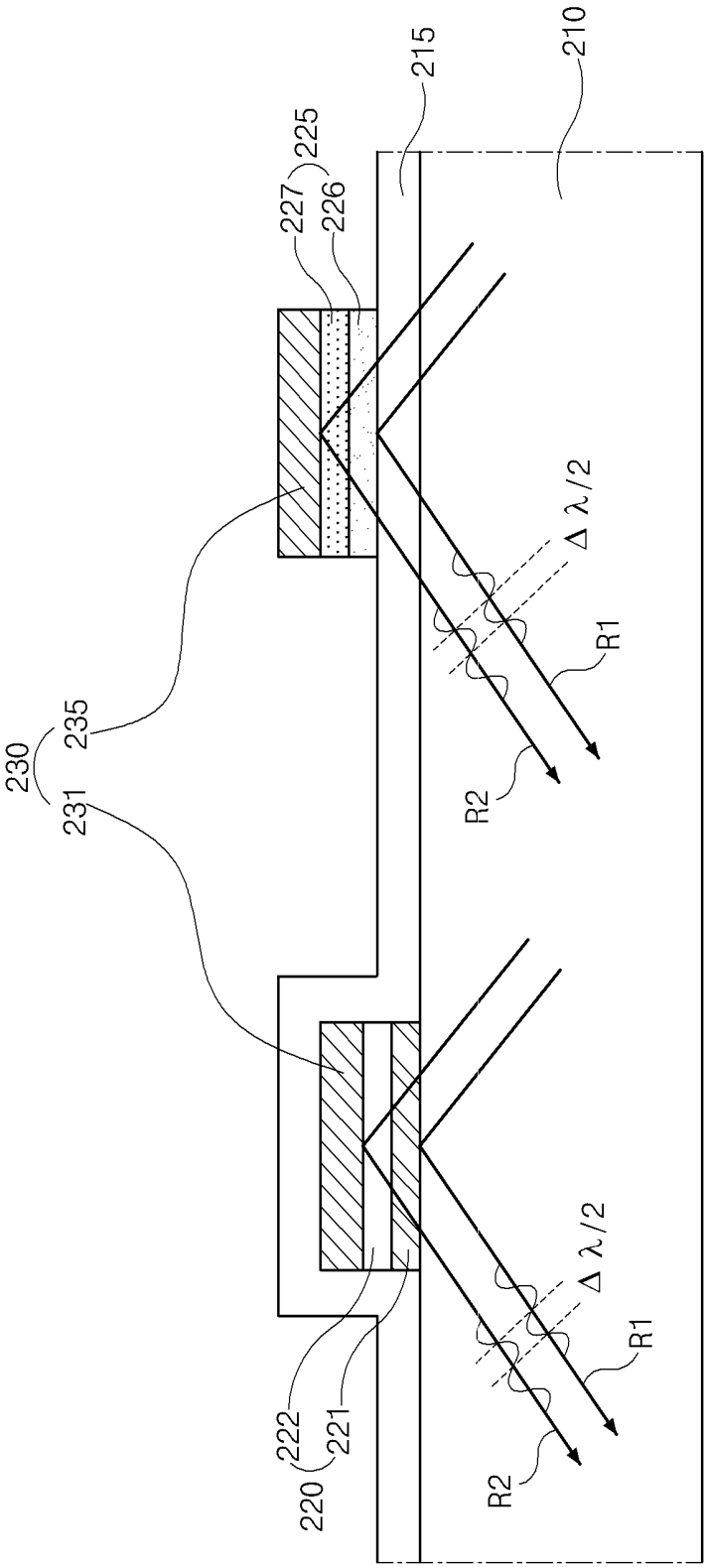
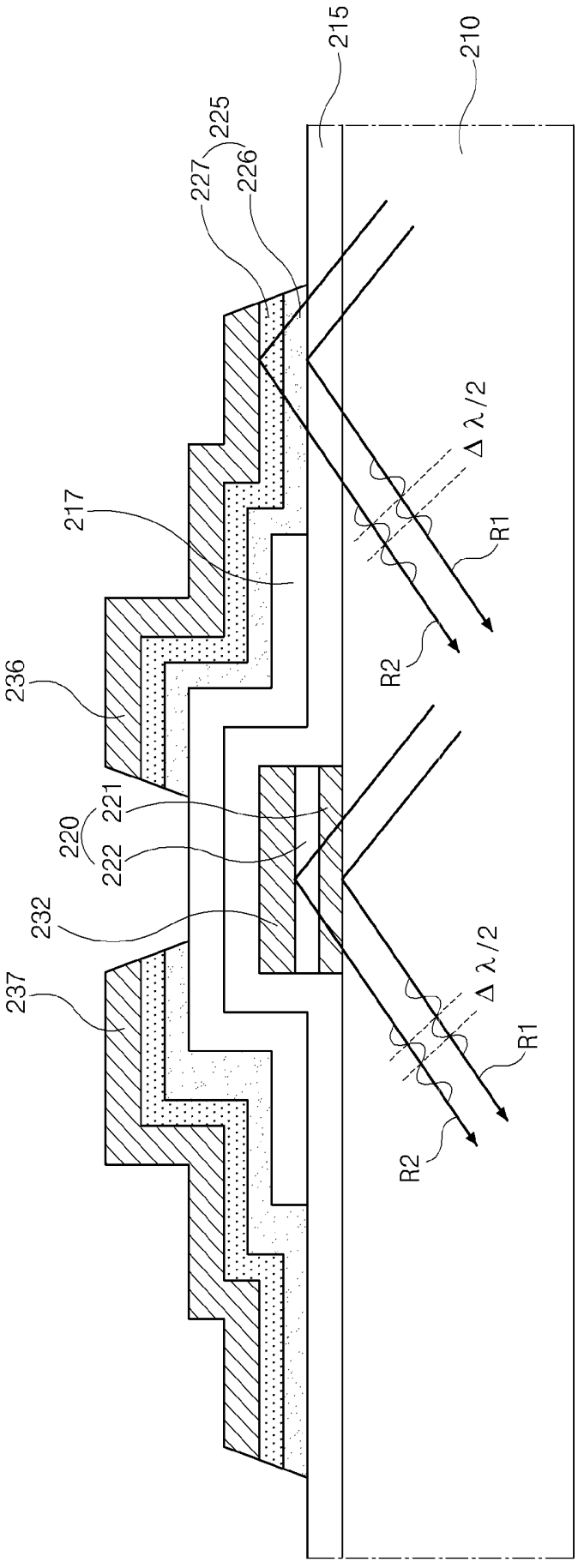


FIG. 7


215
210
225
227
226
217
Δ λ/2
R1
R2
236
221
220
222
232
237
Δ λ/2
R1
R2

ORGANIC LIGHT EMITTING DIODE DISPLAY DEVICE INCLUDING ANTIREFLECTION LINE

This application claims the priority benefit of Korean Patent Application No. 10-2012-0091614, filed on Aug. 22, 2012, which is hereby incorporated by reference in its entirety.

BACKGROUND

Field of the Disclosure

The present disclosure relates to an organic light emitting diode display device, and more particularly, to an active matrix type organic light emitting diode display device.

Discussion of the Related Art

Recently, with rapid development of information technologies, flat panel display (FPD) devices having thin profiles and light weight have been suggested and actively pursued. The flat panel display devices are represented by a liquid crystal display devices and an organic light emitting diode display devices. Since the organic light emitting diode display devices do not need additional light sources such as backlights of the liquid crystal display devices but display sharper images than the liquid crystal display devices.

An organic light emitting diode display devices include pixels which are arranged in a screen, each of which may be comprised of sub-pixels of different colors. The sub-pixels are defined by crossing of gate lines and data lines. Each sub-pixel may be independently driven by driving elements including thin film transistors; the thin film transistors and metallic lines may be disposed in a driving element region. At this time, if the thin film transistors and the metallic lines in the driving element region reflect outside light, outer visibility may be lowered.

FIG. **1** is a cross-sectional view of illustrating a part of an active matrix type organic light emitting diode display device according to the related art.

In FIG. **1**, the organic light emitting diode display device of the related art includes an organic light emitting diode **120** and a polarizer **110** formed on a substrate (not shown) through which light emitted from the organic light emitting diode **120** is transmitted to the outside.

The organic light emitting diode **120** includes an anode electrode **121**, an organic light-emitting layer **122** and a cathode electrode **123**.

When holes injected from the anode electrode **121** are combined with electrons from the cathode electrode **123**, exitons are formed. At this time, light is emitted with a band gap energy of the organic light-emitting layer **122**. The emitted light passes a color refiner **130** and is converted to a desired color.

The polarizer **110** includes a linear polarizer **111** polarizing incident light and a λ/4 phase retarder **113**. The linear polarizer **111** and the λ/4 phase retarder **113** are held together in between by a first adhesive layer **112**.

Light from outside is linearly polarized through the linear polarizer **111**, which may be a horizontal linear polarizer. Thus, light from the outside is horizontally polarized (linear). Furthermore, the linearly polarized light is circularly polarized through the λ/4 phase retarder **113**. For example, it may be left-circularly polarized. The circularly polarized light is reflected by the cathode electrode **123** and passes through the λ/4 phase retarder **113** again. When reflected, the left-circularly polarized light is right-circularly polarized. And through the λ/4 phase retarder **113** it is vertically polarized (linear). Since the vertically polarized (linear) light cannot pass through the horizontal linear polarizer **111**, light from the outside cannot be reflected and the visibility can be improved.

A second adhesive layer **114** is formed outside of the λ/4 phase retarder **113** and adheres the polarizer **110** to the organic light emitting diode display device.

When the reflection of outside light is minimized using the polarizer **110**, less than 45% of light emitted from the organic light emitting diode **120** is transmitted, and more than half of the brightness is deceased. Therefore, if more power consumption is used to compensate the deceased brightness, the lifetime of an organic light emitting layer **122** is reduced.

Further, since the polarizer **110** is relatively expensive, adopting polarizer **110** in order to block the reflection is not so competitive.

SUMMARY

Accordingly, the present invention is directed to an organic light emitting diode display device that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

An advantage of the present invention is to provide an organic light emitting diode display device that can reduce manufacturing costs.

An organic light emitting diode display device includes: a substrate; a first antireflection line formed on the substrate and including a first metallic layer and a first inorganic layer stacked sequentially; a gate line formed on the first antireflection line; a gate insulation layer formed on the substrate and the gate line; a second antireflection line formed on the gate insulation layer and including a second metallic layer and a second inorganic layer stacked sequentially; a data line formed on the second antireflection line; and wherein the first inorganic layer connects the first metallic layer and the gate line electrically and the second inorganic layer connects the second metallic layer and the data line.

In another aspect, an organic light emitting diode display device, comprising: a substrate; a first antireflection line formed on the substrate and including a first metallic layer and a first inorganic layer stacked sequentially; a gate line formed on the first antireflection line; a gate insulation layer on the gate line and on the substrate; a second antireflection line formed on the gate insulation layer and including a second metallic layer and a second inorganic layer stacked sequentially; a data line formed on the second antireflection line; and wherein the gate line and the data line are connected to the first and second metallic layers, respectively.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate exemplary embodiments of the invention and together with the description serve to explain the principles of the invention.

FIG. **1** is a cross-sectional view illustrating a part of an exemplary active matrix type organic light emitting diode display device according to the related art.

FIG. **2** is a cross-sectional view illustrating an exemplary organic light emitting diode display device according to some embodiments of the present invention.

FIG. **3** is a cross-sectional view illustrating first and second antireflection lines of the organic light emitting diode display device according to additional embodiments of the present invention.

FIG. **4** is a cross-sectional view illustrating an exemplary organic light emitting diode display device including first and second antireflection lines according to yet additional embodiments of the present invention.

FIG. **5** is a cross-sectional view illustrating an exemplary organic light emitting diode display device including first and second antireflection lines according to further embodiments of the present invention

FIG. **6** is a cross-sectional view illustrating the principle of the blocking light in the metal line area according to some embodiments of the present invention.

FIG. **7** is a cross-sectional view illustrating the principle of the blocking light in the thin film transistor area according to some embodiments of the present invention

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

Reference will be made in detail to exemplary embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

FIG. **2** is a cross-sectional view illustrating an organic light emitting diode display device according to some embodiments of the present invention.

In FIG. **2**, the organic light emitting diode display device according to some embodiments of the present invention may includes a substrate **210**, first and second antireflection lines **220** and **225**, a metal line **230**, a passivation layer **240**, a color refiner **250**, and an organic light emitting layer **270**.

The substrate **210** may include a plurality of pixels and the pixels may be divided into a light emitting portion and a driving element portion. The light emitting portion is an area where light emits, and the driving element portion is an area where there is no circuit for driving the organic light emitting diode display device.

The first and second antireflection lines **220** and **225** may be formed on the substrate **210** and may block reflection of light from the outside. The reflection of the outside light may occur in the metal area. Thus, blocking reflection of the outside light may enhance the visibility. The first and second antireflection lines **220** and **225** may have the same structure but may be positioned separately. The first antireflection line **220** may be formed under the gate line **231** to block reflection of the outside light at the gate line **231**, and the second antireflection line **225** may be formed under the data line **235** to block reflection of the outside light at the data line **235**.

Since the structures of the first and second antireflection lines **220** and **225** are same with each other, the explanation of the structure is done with regard to the first antireflection line **220**. The first antireflection line **220** may include a first metallic layer **221** and a first inorganic layer **222** on the first metallic layer **221**. In order to enhance the reflection blocking effect, the structure of the first metallic layer **221** and the first inorganic layer **222** may be repeated (e.g. more than 2 times) to form a multi-layered structure. Similarly, the second antireflection line **225** may include a second metallic layer **226** and a second inorganic layer **227** on the second metallic layer **226**.

When the multi-layered structure is adopted, antireflection is excellent, but light transmittance of the organic emitting layer **270** may become low. Thus, the number of layers may be determined by regarding the antireflection and the light transmittance. The structure of the first and second antireflection lines **220** and **225** will be explained with reference to FIGS. **3** and **4**.

The antireflection line **220** brings a destructive interference of light reflected on the metallic layer **221** and light reflected on the metal lines **230** formed on the inorganic layer **222**, resulting in dissipation of the reflected lights. Therefore, if the first metallic layer **221** and the first inorganic layer **222** are formed sequentially on the substrate **210** and the metal lines **230** are formed on the first inorganic layer **222**, the reflection of light from the outside may be prevented by destructive interference of the reflected light at the first metallic layer **221** through the first inorganic layer **222** and the reflected light at the metal line **230**. At this time, the first metallic layer **221** may transmit light partially and the metal line does not transmit light. The principle of dissipation of light will be explained in detail with reference to FIGS. **6** and **7** below.

Meanwhile, the metal lines may be formed in the driving element portion of the pixels. The metal lines **230** include not only a gate line **231** and a data line **235** but also a gate electrode **232** elongated from the gate line **231** and a source electrode **236** elongated from the data line **235**. Also, the metal lines **230** may include a drain electrode **237** of the thin film transistor.

Further, the metal lines may include lines for a compensation circuit which is a circuit for displaying correct tone of wedge of each pixel. To the compensation circuit lines, the thin film transistor, the storage electrode or a line connecting them may be included. The compensation circuit lines further includes a line formed simultaneously with the gate line **231** or the data line **235** or other lines formed on the same layer as the gate line **231** or the data line **235**.

Since there are many metals in most areas of the substrate **210**, the antireflection layer **220** may be formed to cover the entire substrate **210**. However, since the antireflection layer **220** absorbs light emitted from the organic light emitting layer **270** in the light emitting portion, the layer **220** may cause a decrease in the brightness of light. It is possible to form the antireflection layer **220** only in the non-luminous layer by using an additional photolithography process, which will be explained later with reference to FIG. **4**.

As explained above, the metal lines **230** may be formed in the driving element portion of the substrate **210**. The metal lines include the gate electrode **231** of a thin film transistor, the gate line **232** and the compensation circuit line **233**. The compensation circuit line **233** shown in the drawing is a part of an entire compensation circuit, and may be a storage capacitor or a line to be connected to the storage capacitor. However, according to this invention, the metal lines are not limited and can be any line simultaneously formed with the gate electrode **231** or other lines on the same layer. A power line for applying power to each pixel can also be included. The metal lines **230** are not limited to those explained above, any lines or portions that reflect light from the outside may be included.

Therefore, the first antireflection line **220** may elongate to the gate electrode **232**, and the second antireflection line **225** my elongate to the source electrode **236**. Additional antireflection lines may be formed to contact the metal lines **230** or in the corresponding area in the opposing direction of the incident direction of the outside light. For instance, additional antireflection lines may be formed to contact the drain

electrode **23**, the compensation circuit lines, or the power line or in the corresponding area in the opposing direction of the incident direction of the outside light.

Next, the passivation layer **240** may be formed on the metal lines **230** to protect the thin film transistor and the metal lines **230** and to insulate the transistor and the metal lines **230** from the peripheral elements.

Then, the color refiner **250** may be formed on the passivation layer **240** in the light emitting portion. The color refiner **250** may be positioned in an area corresponding to an area where the organic light emitting layer **270** contacts the anode electrode **260** and the cathode electrode **280**. Thus, light emitting in the light emitting portion is converted to a desired color through the color refiner **250**. The color refiner **250** can be recognized as the same element of the color filter of LCD device.

Meanwhile, the vertical position of the color refiner **250** may be determined according to the light emitting method. For example, in the top emission type, it may be positioned on the cathode electrode **280**. And regardless of the light emitting method, it may be positioned regarding manufacturing efficiency or light emitting efficiency.

Next, the organic light emitting layer **270** may be formed on the entire substrate **210**. The light emitting portion emitting light on the substrate **210** is the area where the organic light emitting layer **270** contacts the anode electrode **260** and the cathode electrode **280**, and white light is emitted. The emitted light may pass through the color refiner **250** formed under the organic light emitting layer **270** and may be converted to have a particular color (e.g. one of the color of red, green, blue, yellow, magenta, and cyan), and is emitted to the outside of the substrate **210**.

The light emitting process is as follows. If a current of the direction of easy flow is applied to the anode electrode **260** and the cathode electrode **280**, the holes from the anode electrode **260** and the electrons from the cathode electrode **280** move to the organic light emitting layer **270** and are recombined with each other. The combined holes and electrons are called excitons. If the excitons drop to the ground state, energy is released in the form of light, and the organic light emitting layer **270** emits light.

According to the material of the organic light emitting layer **270**, the color of the emitted light of the pixel varies. A white color is generally accomplished, for example, by mixing red, green, and blue light emitting materials or by stacking red, green, and blue light emitting materials to mix the color of light of the each material.

FIG. **3** is a cross-sectional view showing first and second antireflection lines **220** and **225** according to a first embodiment.

As shown in FIG. **3**, the first antireflection line **220** may be formed by stacking a first inorganic layer **222** on a first metallic layer **221**, and the gate line **231** may be positioned thereon. The second antireflection line **225** may be formed by stacking a second inorganic layer **227** on a second metallic layer **226**, and the data line **235** may be positioned thereon

The first metallic layer **221** may be a thin semi-transparent layer which reflects, transmits, and absorb light. The first inorganic layer **222** may include conductive oxide. Conductive oxide may be transparent to transmit light and electrically connects the first metallic layer **221** and the gate line **231**, which may prevent occurrence of capacitance between the first metallic layer **221** and the gate line **231**.

If the capacitance occurs between the first metallic layer **221** and the gate line **231**, the normal transmittance of electric signal may be disturbed at the gate line **231** and the gate electrode **232** elongated from the gate line **231**. Further, the disturbance may be a reason of various abnormal driving of pixels such that it is impossible to display correct tone wedge of pixels and that light emitting timing of pixels may be delayed.

Thus, by electrically connecting the first metallic layer **221** and the gate line **231** to block occurrence of parasitic capacitance, the antireflection line **220** may block reflection of the outside light and may enable correct transmittance of electric signal to the gate line **231** and the gate electrode **232**.

Similarly to the first antireflection line **220**, the second inorganic layer **227** of the second antireflection line **225** may include conductive oxide and may prevent occurrence of parasitic capacitance between the second metallic layer **226** and the data line **235**. Thus, it is possible to block reflection of light, and it is possible to transmit correct electric signal to the data line **235** and the source electrode **236** elongated from the data line **235**.

FIG. **4** is a cross-sectional view showing first and second antireflection lines **220** and **225** according to some embodiments of the invention.

As shown in FIG. **4**, the first antireflection line **220** may be formed by stacking the first metallic layer **221** and the first inorganic layer **222**. The first metallic layer **221** may be a thin semi-transparent layer which reflects, transmits, and absorb light. The first inorganic layer **222** may be transparent insulation material.

The first inorganic layer **222** may be positioned the gate line **231**. The side edge portion of the gate line **231** may elongate on the side of the first inorganic layer **222** towards the first metallic layer **221** to be connected to the first metallic layer **221**. Further, either side edge portions or one side edge portion of the gate line **231** may elongate to the first metallic layer **221**. Still further, either the entire portion or a portion of the side edge area may contact the first metallic layer **221**.

The second antireflection line **225** may be formed by stacking the second metallic layer **226** and the second inorganic layer **227**. The second metallic layer **226** may be a thin semi-transparent layer which reflects, transmits, and absorbs light. The second inorganic layer **227** may be transparent insulation material.

On the second inorganic layer **227** may be positioned the data line **235**. Like data line **231**, the side edge portion of the data line **235** may elongate on the side of the second inorganic layer **227** towards the second metallic layer **226** to be connected to the second metallic layer **226**. Further, either side edge portions or one side edge portion of the data line **235** may elongate to the second metallic layer **226**. Still further, either the entire portion or a portion of the side edge area may contact the second metallic layer **226**.

When the gate line **231** and the data line **235** are connected to the first and second metallic layers **221** and **226**, respectively, occurrence of parasitic capacitance may be prevented. Thus, it is possible to block reflection of light. Moreover it is possible to transmit correct electric signal to the gate line **231** and the gate electrode **232**.

FIG. **5** is a cross-sectional view showing first and second antireflection lines **220** and **225** according to additional embodiments of the invention.

As shown in FIG. **5**, the first antireflection line **220** may be formed by stacking the first metallic layer **221** and the first inorganic layer **222**, on which the gate line **231** is disposed. The first inorganic layer **222** may be transparent insulation material and may be patterned to expose the first metallic layer **221**, to which the gate line **231** is connected. More than one area of the first inorganic layer **222** may be

patterned to connect the gate line **231** to the first metallic layer **221** through the more than one patterned area.

Similarly to the first antireflection line **220**, the second antireflection line **225** may be formed by stacking the second metallic layer **226** and the second inorganic layer **227**, on which the data line **235** is disposed. The second inorganic layer **227** may be transparent insulation material and may be patterned to expose the second metallic layer **226**, to which the data line **235** is connected. More than one area of the second inorganic layer **226** may be patterned to connect the data line **235** to the second metallic layer **226** through the more than one patterned area.

Since the gate line **231** and the data line **235** are connected to the first and second metallic layers **221** and **226**, respectively, occurrence of parasitic capacitance can be prevented. Thus, it is possible to block reflection of light, moreover it is possible to transmit correct electric signal to the gate line **231** and the gate electrode **232**.

FIG. **6** is a cross-sectional view illustrating the principle of the blocking reflection in the metal line area according to some embodiments of the invention.

As shown in FIG. **6**, the first antireflection line **220** may include the first metallic layer **221** and the first inorganic layer **222**, on which the gate line **231** may be formed. The antireflection line **220** may be formed by stacking the first metallic layer **221** and the first inorganic layer **222** sequentially on the substrate **210**. Under the metallic layer **221**, an additional inorganic layer (not shown) may be formed. And in order to increase the effect of blocking reflection, the above structure may be repeated to have a multi-layered structure.

The processes of blocking reflection of light of the first antireflection line **220** may include the following two processes. One is that of absorbing the outside light and the other is that of dissipation of light by destructive interference of light from the first metallic layer **221** and light from the gate line **231** formed on the first inorganic layer **222**.

The processes will be explained in detail. If the outside light incident on the substrate **210** meets the first metallic layer **221**, a portion of the light is reflected to be a first reflection light (R1); then anther portion of the light is absorbed by the first metallic layer **221** and the rest of the light is transmitted. A portion of the transmitted light is reflected at the gate line **231** to be a second reflection light (R2) and the rest of the light transmits the first inorganic layer **222**. At this time, as shown in the figure, if the first and second reflection lights R1 and R2 have phase difference of $\lambda/2$, destructive interference occurs, and the reflection lights are dissipated.

To cause the destructive interference, the first metallic layer **221** may be made of a metallic material (e.g. titanium (Ti), molybdenum (Mo), chromium (Cr), or a mixture thereof) and may have a thickness from about 50 Å to about 200 Å, from about 80 Å to about 100 Å, or from about 50 Å to about 150 Å. If the materials formed as a thin film having a thickness of about 50 Å to about 200 Å, light may be partially transmitted, like the sun glasses or polarizing plates. Therefore, the transmitted light from the organic light emitting layer **270** may be emitted to the outside of the substrate **210**.

The first inorganic layer **222** may be formed of a conductive oxide (e.g. Indium Tin Oxide). Since the conductive material is conductive, the parasitic capacitance that may occur between the first metallic layer **221**, and the gate line **231** may be prevented. Further, since the conductive material is transparent, the time for light to reach the gate line **231** from the first metallic layer **221** is constantly maintained. In order to bring destructive interference the first inorganic layer **222** has a thickness from about 500 Å to about 3000 Å, from about 800 Å to about 2500 Å, from about 1000 Å to about 1500 Å, or from about 1000 Å to about 2000 Å.

For example, when the antireflection line **220** had a multilayered structure in which the insulation layer **222**, the metallic layer **221**, and the insulation layer **222** having thicknesses of 800 Å, 150 Å, and 800 Å, respectively, were stacked in sequence, light transmittance was 44%, which is bigger than the polarization plate by 1%.

The thicknesses of the first metallic layer **221** and the first inorganic layer **222** may be adjusted to cause the destructive interference. This is because that the distance between the reflection points of the first and second reflection lights (R1 and R2) may determine overlapping of peaks of the first reflection light (R1) and toughs of the second reflection light (R2).

Further, the second antireflection line **225** may also include the second metallic layer **226** and the second inorganic layer **227**, on which the data line **235** is formed. The second antireflection line **225** may be formed by stacking the second metallic layer **226** and the second inorganic layer **227** sequentially on the substrate **210**. Under the second metallic layer **226**, an additional inorganic layer (not shown) may be formed. And, in order to increase the effect of blocking reflection, the above structure may be repeated to have a multi-layered structure.

The second antireflection line **225** may be elongated corresponding to the data line **235** elongated to the source electrode **236**, thus reflection of the outside light at the gate electrode **232** can be prevented. However, since the second antireflection line **225** beneath the source electrode **236** should contact a semiconductor layer **217**, a contact problem or a driving problem may occur. In this case, an additional antireflection line may be formed simultaneously with the first antireflection line **220** formed under the gate electrode **232** on the substrate **210** in the corresponding area of the source electrode **236**. On the additional antireflection line may be formed an additional metallic layer of the same material as the gate electrode **232** to satisfy the destructive interference condition.

Further, a data pad portion (not shown) may be formed by elongating the data line **235** and the second antireflection line **225** can be elongated corresponding to the data pad portion. In this case, same as the case of the source electrode **236**, an additional antireflection line may be formed.

As explained above, the second antireflection line **225** may be elongated corresponding to the elongated data line **235** and the area that may be elongated is not limited.

Further, since the second antireflection line **225** is under the data line **235** which is generally formed on the gate insulation layer **215**, the second antireflection line **225** may be formed on the gate insulation layer **215** and contact the data line **235**. Or, the second antireflection line **225** may be formed on the substrate in an area corresponding to the data line **235**. In other words, the second antireflection line **225** may be formed in an area corresponding to the data line **235** to oppose the incident direction of the outside light.

When the second antireflection line **225** is formed on the substrate **210** in an area corresponding to the data line **235**, it is possible to satisfy the destructive interference condition by forming an additional metallic layer on the second antireflection line **225**. The additional metallic layer may form the second reflection light R2 instead of the data line **235**. The additional metallic layer may be formed simultaneously with the gate electrode **232**.

Meanwhile, the principle of blocking reflection of the second antireflection line **225** is the same as that of the first antireflection line **220** and utilizes destructive interference of the first and second reflection lights R1 and R2 reflected at the second metallic layer **226** and the data line **235**, respectively, to block reflection of light from the outside.

The second inorganic layer **227** may be formed of a conductive oxide (e.g. Indium Tin Oxide) that is the same as the first inorganic layer **222**, which is not limited. Thus, the parasitic capacitance that may occur between the second metallic layer **226** and the data line **235** may be prevented.

Meanwhile, besides the first and second antireflection lines **220** and **225**, additional antireflection lines may be formed. There are many metal lines **230** within the pixel to drive the pixel besides the gate and data lines **231** and **235**. The additional antireflection lines may be formed in the corresponding area of these metal lines to oppose the incident direction of the outside light.

For instance, an additional antireflection line may be formed under the drain electrode **237**. In this case that is similar to the case of the source electrode **236**, the additional antireflection line may be formed under the drain electrode **237** to contact the semiconductor layer **217** or an additional antireflection line may be formed simultaneously with the first antireflection line **220** formed under the gate electrode **232** on the substrate **210** in the corresponding area of the drain electrode **237**.

Since the metal lines **230** may be formed simultaneously with the gate line **231** and the data line **235**, the additional antireflection line may be formed simultaneously with the first antireflection line **220** or the second antireflection line **225**.

FIG. **7** is a cross-sectional view illustrating the principle of the blocking reflection in the thin film transistor area according to the first embodiment of the invention.

As shown in FIG. **7**, under the gate electrode **232**, the first antireflection line **220** may be elongated to block reflection of the outside light at the gate electrode **232**. Further, the first antireflection line **220** may be elongated to the corresponding area that the gate line **231** is elongated, for instance, to the gate pad (not shown). In other words, the elongated area of the first antireflection line **220** is not limited.

Under the source electrode **236**, the second antireflection line **225** may be elongated. Since the source electrode **236** is formed to be elongated from the data line **235** (not in the figure?), the second antireflection line **225** may elongate. The second inorganic layer **227** may be conductive oxide to enable transmittance of the electric signals to the source electrode **236**.

Under the drain electrode **237**, an additional antireflection line may be formed separated from the second antireflection line **225**. The additional antireflection lines include a metallic layer and an inorganic layer same as the first and second antireflection lines **220** and **225**. The inorganic layer may be conductive oxide and enables transmittance of the electric signals to the drain electrode **237**.

According to the invention, since antireflection lines having a metallic layer and an inorganic layer are adopted in order to block reflection of the outside light, the use of expensive polarization plate may be eliminated, resulting in lowering manufacturing costs.

Further, by electrically connecting the metallic layer of the antireflection line and the metal lines, the parasitic capacitance which may occur between the antireflection line and the metal lines can be prevented, resulting in signal transmittance to the metal lines can be properly controlled.

Still further, by using an antireflection line of high transmittance, the brightness can be increased and electricity consumption can be reduced.

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

What is claimed is:

1. An organic light emitting diode display device, comprising:
- a substrate;
- a first antireflection line formed on the substrate and including a first metallic layer and a first inorganic layer on the first metallic layer;
- a gate line formed directly on the first inorganic layer of the first antireflection line;
- a gate insulation layer formed on the substrate and the gate line;
- a second antireflection line formed on the gate insulation layer and including a second metallic layer and a second inorganic layer on the second metallic layer;
- a data line formed directly on the second inorganic layer of the second antireflection line; and
- wherein the first inorganic layer connects the first metallic layer and the gate line electrically and the second inorganic layer connects the second metallic layer and the data line, wherein the first metallic layer is a thin semi-transparent layer,
- wherein the first metallic layer and the first inorganic layer of the first antireflection line are disposed under the gate line to be closer than the gate line to the substrate, and the second metallic layer and the second inorganic layer of the second antireflection line are disposed under the data line to be closer than the data line to the substrate,
- wherein the first antireflection line is disposed under the gate insulation layer and the second antireflection line is disposed above the gate insulation layer.

2. The device according to claim **1**, further comprising:
- a gate electrode elongated from the gate line,
- wherein the first antireflection line is elongated to the gate electrode.

3. The device according to claim **1**, further comprising:
- a source electrode elongated from the data line,
- wherein the second antireflection line is elongated to the source electrode.

4. The device according to claim **1**, further comprising:
- a third antireflection line formed on the gate insulation layer and including a third metallic layer and a third inorganic layer stacked sequentially.

5. The device according to claim **4**, further comprising:
- a metal line formed on the third antireflection line,
- wherein the third inorganic layer electrically connects the third metallic layer and the metal line.

6. The device according to claim **5**, wherein the metal line includes a drain electrode, a power line, a storage electrode and a compensation circuit line.

7. The device according to claim **4**, wherein the first, second and third metallic lines include a material selected from the group consisting of titanium (Ti), molybdenum (Mo), chromium (Cr), and a mixture thereof.

8. The device according to claim **4**, wherein the first, second and third inorganic layers include a material selected

from the group consisting of Indium Tin Oxide, Indium Zinc Oxide, Tin Oxide, Zinc Oxide, and a mixture thereof.

9. An organic light emitting diode display device, comprising:

a substrate;

a first antireflection line formed on the substrate and including a first metallic layer and a first inorganic layer on the first metallic layer;

a gate line formed directly on the first inorganic layer of the first antireflection line;

a gate insulation layer on the gate line and on the substrate;

a second antireflection line formed on the gate insulation layer and including a second metallic layer and a second inorganic layer on the second metallic layer;

a data line formed directly on the second inorganic layer of the second antireflection line; and

wherein the gate line and the data line are connected to the first and second metallic layers, respectively, wherein the first metallic layer is a thin semi-transparent layer,

wherein the first metallic layer and the first inorganic layer of the first antireflection line are disposed under the gate line to be closer than the gate line to the substrate, and the second metallic layer and the second inorganic layer of the second antireflection line are disposed under the data line to be closer than the data line to the substrate,

wherein the first antireflection line is disposed under the gate insulation layer and the second antireflection line is disposed above the gate insulation layer.

10. The device according to claim **9**, wherein the gate line and the data line are connected to the first and second metallic layers, respectively, at side edge area.

11. The device according to claim **9**, wherein the gate line and the data line penetrate the first and second inorganic layers to be connected to the first and second metallic layers, respectively.

12. The device according to claim **9**, wherein the first and second metallic lines include a material selected from the group consisting of titanium (Ti), molybdenum (Mo), chromium (Cr), and a mixture thereof.

13. The device according to claim **9**, wherein the first and second inorganic layers include a material selected from the group consisting of Indium Tin Oxide, Indium Zinc Oxide, Tin Oxide, Zinc Oxide, and a mixture thereof.

* * * * *

专利名称(译)	有机发光二极管显示装置包括抗反射线		
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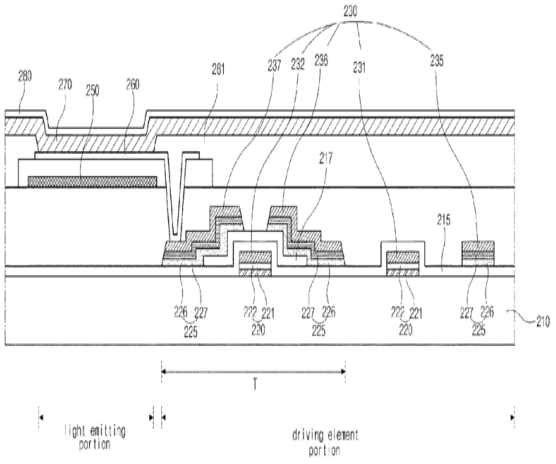
有机发光二极管显示装置包括：基板;第一抗反射线，形成在所述基板上并且包括顺序堆叠的第一金属层和第一无机层;形成在所述第一抗反射线上的栅极线;形成在衬底和栅极线上的栅极绝缘层;第二抗反射线，形成在所述栅极绝缘层上并且包括顺序堆叠的第二金属层和第二无机层;形成在第二抗反射线上的数据线;并且其中所述第一无机层电连接所述第一金属层和所述栅极线，并且所述第二无机层连接所述第二金属层和所述数据线。