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(54) **ORGANIC LIGHT-EMITTING STRUCTURE AND DISPLAY DEVICE**

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H01L 51/50 (2006.01)

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See application file for complete search history.

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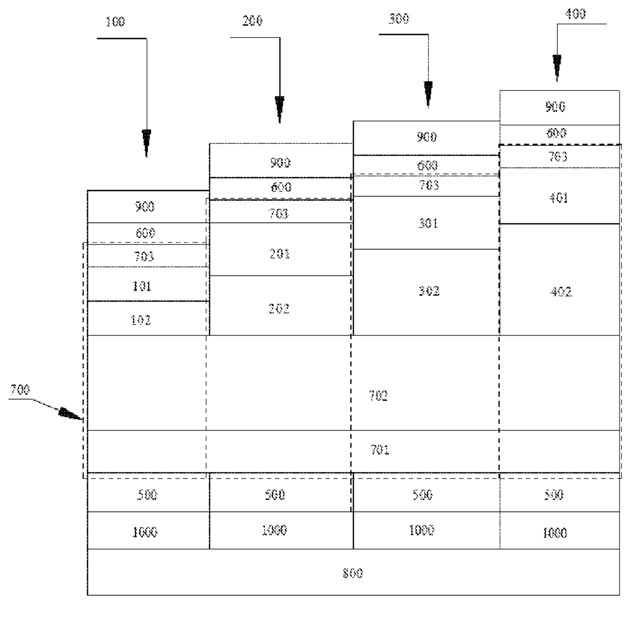
(57) **ABSTRACT**

An organic light-emitting structure is described. The organic light-emitting structure includes a first light-emitting unit, a second light-emitting unit, a third light-emitting unit, and a fourth light-emitting unit. Each of the first light-emitting unit, the second light-emitting unit, the third light-emitting unit, and the fourth light-emitting unit comprises a first electrode, a second electrode, and an organic laminated body placed between the first electrode and the second electrode. One of the first electrode and the second electrode is a translucent electrode. At least one light-emitting unit is a fluorescent light-emitting unit. The color gamut range of the organic light-emitting structure is increased, the color saturation of the light-emitting device is improved, and quantity of colors is increased, so that the development trend of color reproducibility for the display devices can be satisfied.

14 Claims, 1 Drawing Sheet



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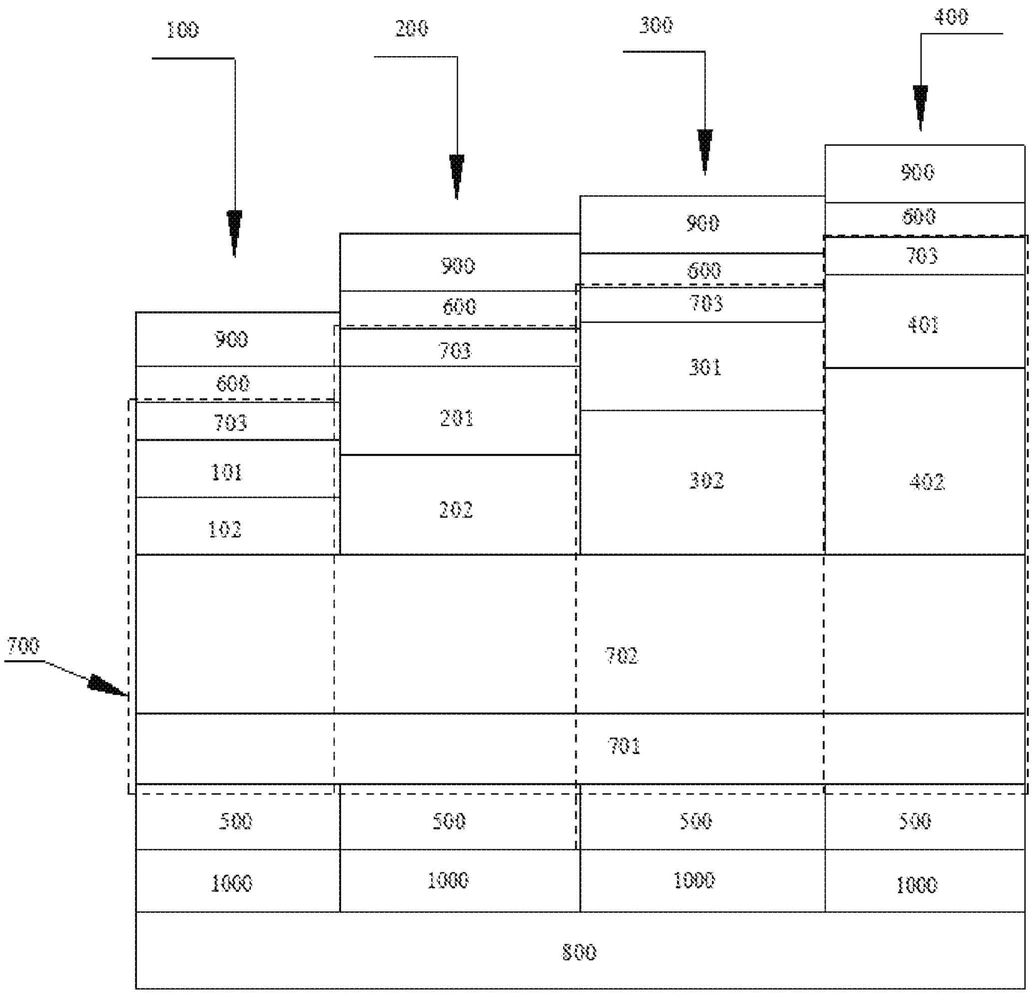
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ORGANIC LIGHT-EMITTING STRUCTURE AND DISPLAY DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims the benefit of priority to Chinese Patent Application No. 201710443755.2, filed on Jun. 13, 2017, the content of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

The present disclosure relates to the field of display technologies and, particularly, to an organic light-emitting structure, and a display device.

BACKGROUND

An organic light-emitting diode (OLED) can be used as a light source for a display device or for a lighting device, which has advantages of wide view angle, short response time, small thickness, light weight, and ability of bending with any angles.

An OLED light emitting device may be either an active-matrix organic light emitting diode (AMOLED) or a passive-matrix organic light emitting diode (PMOLED). When compared with PMOLED, AMOLED has advantages of low energy consumption, high resolution, fast response, and other good photoelectric properties, which becomes a mainstream technology of OLED display.

Traditional AMOLED light emitting devices all consist of RGB (three primary colors), and use RGB to realize full-color images. However, a color gamut range of the three primary colors of RGB is limited, resulting in a poor color saturation and a less color quantity of the AMOLED light emitting devices, and the device cannot meet development demands on color reproducibility for all kinds of the display devices.

SUMMARY

The present disclosure provides an organic light-emitting structure, and a display device, to solve the above-mentioned problems.

A first aspect of the present disclosure is to provide an organic light-emitting structure, including a first light-emitting unit, a second light-emitting unit, a third light-emitting unit, and a fourth light-emitting unit; each of the first light-emitting unit, the second light-emitting unit, the third light-emitting unit, and the fourth light-emitting unit includes a first electrode, a second electrode, and an organic laminated body; one of the first electrode and the second electrode is a translucent electrode; and the organic laminated body includes a light-emitting layer; and at least one of the first light-emitting unit, the second light-emitting unit, the third light-emitting unit, and the fourth light-emitting unit is a fluorescent-light emitting unit.

A second aspect of the present disclosure is to provide a display device, including the organic light-emitting structure as mentioned above.

It should be understood that, the general description as above and the detailed description hereinafter are exemplary, and they do not limit the present disclosure.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a structural schematic diagram of an organic light-emitting structure according to an embodiment of the present disclosure.

REFERENCE

100—first light-emitting unit
101—first light-emitting layer
102—first monochromic hole transmission layer
200—second light-emitting unit
201—second light-emitting layer
202—second monochromic hole transmission layer
300—third light-emitting unit
301—third light-emitting layer
302—third monochromic hole transmission layer
400—fourth light-emitting unit
401—fourth light-emitting layer
202—fourth monochromic hole transmission layer
500—first electrode
600—second electrode
700—organic laminated body
701—common hole injection layer
702—common hole transmission layer
703—common electron transmission layer
800—substrate
900—light extraction layer

The above-mentioned drawing is incorporated into the specification and constitutes a part of the specification, which shows embodiments according to the present disclosure, and is used for illustrating principles of the present disclosure.

DESCRIPTION OF EMBODIMENTS

The present disclosure will be described in details with reference to the accompanying drawing and embodiments thereof.

As shown in FIG. **1**, an embodiment of the present disclosure provides an organic light-emitting structure, which can be used for AMOLED. The organic light-emitting structure includes a first light-emitting unit **100**, a second light-emitting unit **200**, a third light-emitting unit **300**, and a fourth light-emitting unit **400**. Each of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** includes a first electrode **500**, a second electrode **600**, and an organic laminated body **700** placed between the first electrode **500** and the second electrode **600**. One of the first electrode **500** and the second electrode **600** is a translucent electrode. The organic laminated body **700** includes a light-emitting layer. Furthermore, at least one of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** is a fluorescent-light emitting unit. That is to say, only one, two or three of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** can be fluorescent-light emitting unit, or all of them can be fluorescent-light emitting units. Colors of lights emitted from the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** are different from each other. For example, the light colors of the four units can be blue, green, yellow, and red, respectively. The organic laminated body **700** usually includes a common electron transmission layer

703, a hole transmission layer, and a light-emitting layer. The light-emitting layer is placed between the common electron transmission layer **703** and the hole transmission layer. In the light-emitting unit (e.g., the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, or the fourth light-emitting unit **400**), an ITO transparent electrode and a metal electrode are used as an anode (i.e., the first electrode **500**) and a cathode (i.e., the second electrode **600**) of the light-emitting unit, respectively. Driven under a certain voltage, electrons and holes are respectively injected into the common electron transmission layer and the hole transmission layer from the cathode and the anode, are transmitted to the light-emitting layer through the common electron transmission layer and the hole transmission layer, respectively, and meet each other in the light-emitting layer, thereby forming excitons and exciting the luminescent molecules, and the luminescent molecules emitting the visible light by radiation relaxation.

Light of each light-emitting unit comes from the light-emitting layer of the organic laminated body **700**. The light-emitting layer of the first light-emitting unit **100** can be defined as a first light-emitting layer **101**, the light-emitting layer of the second light-emitting unit **200** can be defined as a second light-emitting layer **201**, the light-emitting layer of the third light-emitting unit **300** can be defined as a third light-emitting layer **301**, and the light-emitting layer of the fourth light-emitting unit **400** can be defined as a fourth light-emitting layer **401**. One, two, three, or four of the first light-emitting layer **101**, the second light-emitting layer **201**, the third light-emitting layer **301**, and the fourth light-emitting layer **401** can be made of fluorescent material.

Conventional organic light-emitting structure uses the three primary colors of RGB, so that it is needed to extract yellow light from yellow spectrum including red light and green light when displaying. However, in the present disclosure, the organic light-emitting structure includes the above-mentioned four light-emitting units, including the first light-emitting unit, the second light-emitting unit, the third light-emitting unit, and the fourth light-emitting unit. Light colors of the four light-emitting units are different from each other, and one of the four light-emitting units can be a yellow-light emitting unit. Thus, the yellow-light emitting unit can be an independent light-emitting unit, and can independently display yellow color. Compared with the yellow light extracted from the conventional three primary colors of RGB, the yellow light emitted by the yellow-light emitting unit is purer, which can expand color gamut range. In addition, the wider color gamut range can be combined with the RGB three primary colors in various ways, so that more colors can be displayed, the color saturation of the light-emitting device is improved, and the color quantity is increased, for better meeting the development trend of color reproducibility of the display device. Furthermore, among four colors of red, green, blue, and yellow, a service lifetime of phosphorescence emitting blue light is relatively short, which results in that the blue light substantially cannot be used, while a service lifetime of blue light of fluorescence is relatively long, so that at least one of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** is the fluorescent light-emitting unit, in particular, one light-emitting unit used as a blue-light emitting unit is preferably the fluorescent light-emitting unit, which can prolong the service lifetime of the organic light-emitting structure, and enrich material kinds of light-emitting layer of each light-emitting unit, so as to facilitate to select material.

Usually, each of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** further includes a substrate **800**. The first electrode **500**, the organic laminated body **700**, and the second electrode **600** are placed on one side of the substrate **800**. The first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** can share one substrate **800**. The substrate **800** can be a glass substrate, and a thin film transistor can be placed on the substrate **800**, so that working states of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** can be controlled.

In nature, the luminous efficiency of the phosphorescent materials is greater than the luminous efficiency of the fluorescent materials, so that at least one of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** is a fluorescent light-emitting unit, and the others are phosphorescent light-emitting units. That is to say, among the four light-emitting units, there are both fluorescent light-emitting unit and the phosphorescent light-emitting unit. For example, the first light-emitting unit **100** is the fluorescent light-emitting unit, and the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** are phosphorescent light-emitting units. That is to say, the material of the first light-emitting layer **101** is the fluorescent material, to form the first light-emitting unit **100** as the fluorescent light-emitting unit, and the materials of the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** are the phosphorescent materials, to form the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** as the phosphorescent light-emitting units. Since among materials for emitting blue, green, yellow, and red lights, only the phosphorescent materials for emitting red, green, and yellow lights are abundant and have a long service time, while phosphorescent materials for emitting blue light are not abundant, and has a short service time, in practical use, some light-emitting unit adopts the phosphorescent materials, while some light-emitting unit adopts the fluorescent materials, especially, the light-emitting unit emitting blue light adopts the fluorescent materials, and the other light-emitting units adopt the phosphorescent materials, so that the luminous efficiency of the other light-emitting units can be improved greatly, the service life of the organic light-emitting structure can be prolonged, and the luminous efficiency of each light-emitting unit can be improved.

Among various display devices, a wavelength of light emitted from the light-emitting unit has a significant effect on the color purity of a display panel. In the present disclosure, the emission wavelengths of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** successively increase, the peak wavelength of each light-emitting unit is precisely controlled, and the pick wavelengths of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** successively increase, i.e., the peak wavelength of the second light-emitting unit **200** is greater than the peak wavelength of the first light-emitting unit **100**, the peak wavelength of the third light-emitting unit **300** is greater than the peak wavelength of the second light-emitting unit **200**, and the peak wavelength of the fourth light-emitting unit **400** is greater than the peak wavelength of the third light-emitting unit **300**. Optionally, the wavelength of the first light-emitting unit **100** is in a range of 440 nm-480 nm, the wavelength of the second light-emitting unit **200** is in a range of 500 nm-540 nm, the wavelength of the third light-emitting unit **300** is in a range of 550 nm-590 nm, and the wavelength of the fourth light-emitting unit **400** is in a range of 600 nm-640 nm, so that the peak wavelengths of the four light-emitting units do not overlap with each other, and a range of the wavelength is narrow. Thus, a color of light emitted from each light-emitting unit is purer, and the color purity of the display panel can be effectively improved.

In each light-emitting unit, one of the first electrode **500** and the second electrode **600** is a translucent electrode. When light passes through the translucent electrode, transmission and reflection may happen, and in that case, light interference will happen in the light-emitting unit, forming a microcavity effect. By changing the transmission route of light in the microcavity (optical distance), a wavelength range of light can be narrowed as smaller as possible, so that monochromaticity can be better, thereby improving the luminous efficiency of each light-emitting member. Since light interference will happen in the microcavity of each light-emitting unit, each light-emitting unit can define a light intensity according to selection of length of light route (optical distance). That is to say, while the light intensity increases, the optical distance increases, the wavelengths of the light-emitting units are different from each other. Wavelengths of light emitted from the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** are different from each other. Accordingly, optimal thicknesses of the organic laminated bodies **700** of the light-emitting units are different from each other. The thickness of the organic laminated body **700** can be adjusted to adapt to the corresponding wavelength. That is to say, by adjusting the optical distance of light emitted from each light-emitting unit, the intensity of light emitting out of the light-emitting unit can be optimized.

While an emission wavelength of the first light-emitting unit **100**, an emission wavelength of the second light-emitting unit **200**, an emission wavelength of the third light-emitting unit **300**, and an emission wavelength of the fourth light-emitting unit **400** successively increase, i.e., the emission wavelength of the second light-emitting unit **200** is greater than the emission wavelength of the first light-emitting unit **100**, the emission wavelength of the third light-emitting unit **300** is greater than the emission wavelength of the second light-emitting unit **200**, and the emission wavelength of the fourth light-emitting unit **400** is greater than the emission wavelength of the third light-emitting unit **300**, the thicknesses of the first light-emitting layer **101**, the second light-emitting layer **201**, the third light-emitting layer **301**, and the fourth light-emitting layer **401** also successively increase, i.e., the thickness of the second light-emitting layer **201** is greater than the thickness of the first light-emitting layer **101**, the thickness of the third light-emitting layer **301** is greater than the thickness of the second light-emitting layer **201**, and the thickness of the fourth light-emitting layer **401** is greater than the thickness of the third light-emitting layer **301**. Therefore, by setting the thicknesses of the light-emitting layers, the optical distances of light inside the light-emitting units are different from each other, so that the intensity of light emitted out of the light-emitting unit increases, thereby improving the luminous efficiency and brightness of the organic light-emitting structure.

Optionally, the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** are successively placed along an extending direction of the substrate **800** as shown in FIG. **1**. In this case, the thickness of the first light-emitting layer **101** is in a range of 18 nm-22 nm, such as 18 nm, 19 nm, 20 nm, 21 nm, and 22 nm. The thickness of the second light-emitting layer **20*l*** is in a range of 31.5 nm-38.5 nm, such as 32.5 nm, 33 nm, 35 nm, 37 nm, 38 nm, and 38.5 nm. The thickness of the third light-emitting layer **301** is in a range of 31.5 nm-38.5 nm, such as 32.5 nm, 33 nm, 35 nm, 37 nm, 38 nm, and 38.5 nm. The thickness of the fourth light-emitting layer **401** is in a range of 36 nm-44 nm, such as 36 nm, 38 nm, 40 nm, 42 nm, 43 nm, and 44 nm. Since the thicknesses of the light-emitting layers of the light-emitting units are different from each other, the optical distances of light in the microcavity of the light-emitting units can be effectively controlled, so that the microcavity effect can be optimized, thereby improving the luminous efficiency of each light-emitting unit.

Furthermore, the thickness of a hole transmission layer of the first light-emitting unit **100**, the thickness of a hole transmission layer of the second light-emitting unit **200**, the thickness of a hole transmission layer of the third light-emitting unit **300**, and the thickness of a hole transmission layer of the fourth light-emitting unit **400** successively increase, that is, the thickness of a hole transmission layer of the second light-emitting unit **200** is greater than the thickness of a hole transmission layer of the first light-emitting unit **100**, the thickness of a hole transmission layer of the third light-emitting unit **300** is greater than the thickness of a hole transmission layer of the second light-emitting unit **200**, and the thickness of a hole transmission layer of the fourth light-emitting unit **400** is greater than the thickness of a hole transmission layer of the third light-emitting unit **300**, so that, by adjusting the thickness of each film layer in the organic laminated body **700**, the optical distance of light in the microcavity of each light-emitting unit can be adjusted, to better adapt wavelength of different light-emitting unit and to optimize the microcavity effect, thereby improving the luminous efficiency of the entire organic light-emitting structure.

The hole transmission layer of each light-emitting unit can only include a monochromic hole transmission layer. In that case, in each light-emitting unit, the thickness of the monochromic hole transmission layer is equal to the thickness of the hole transmission layer. Since electrons can leak from the light-emitting layer, the electrons can enter into the hole transmission layer contacting with the electrons, and the higher the hole mobility of a material, the more easily the material decomposes. Thus, for decreasing decomposition of the hole transmission layer as possible, the hole transmission layer of each light-emitting unit includes the monochromic hole transmission layer and common hole transmission layer **702** stacked together with the monochromic hole transmission layer, and the common hole transmission layer **702** is away from the light-emitting layer relative to the monochromic hole transmission layer. In that case, the thickness of the hole transmission layer is equal to a sum of the thickness of the common hole transmission layer **702** and the thickness of the monochromic hole transmission layer. As shown in FIG. **1**, the material of the common hole transmission layer **702** is different from the material of the monochromic hole transmission layer. That is to say, each of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** includes the common hole transmission layer **702** and the monochromic hole transmission layer, and the monochromic hole transmission layer is adjacent to the light-emitting layer, so that each common hole transmission layer **702** is made of a same material, and is made of a commonly used hole transmission material; and the monochromic hole transmission layers are made of different electron-resistant materials, for preventing the electron in the light-emitting layer from entering into the monochromic hole transmission layer and preventing the decomposition of the monochromic hole transmission layer, and thereby prolonging the service life time of the organic light-emitting structure. Additionally, in that case, the thickness of the hole transmission layer of the organic laminated body **700** can be increased, charge carriers of each light-emitting unit can achieve equilibrium, and preventing forming of a poor structure, for example, a structure in which particles are formed.

The monochromic hole transmission layer of the first light-emitting unit **100** can be defined as a first monochromic hole transmission layer **102**, the monochromic hole transmission layer of the second light-emitting unit **200** can be defined as a second monochromic hole transmission layer **202**, the monochromic hole transmission layer of the third light-emitting unit **300** can be defined as a third monochromic hole transmission layer **302**, and the monochromic hole transmission layer of the fourth light-emitting unit **400** can be defined as a fourth monochromic hole transmission layer **402**. The first monochromic hole transmission layer **102**, the second monochromic hole transmission layer **202**, the third monochromic hole transmission layer **302**, and the fourth monochromic hole transmission layer **402** are separately prepared, respectively. In that manner, the thicknesses of the common hole transmission layers **402** are identical, and the thickness of the first monochromic hole transmission layer **102**, the thickness of the second monochromic hole transmission layer **202**, the thickness of the third monochromic hole transmission layer **302**, and the thickness of the fourth monochromic hole transmission layer **402** successively increase, i.e., the thickness of the second monochromic hole transmission layer **202** is greater than the thickness of the first monochromic hole transmission layer **102**, the thickness of the third monochromic hole transmission layer **302** is greater than the thickness of the second monochromic hole transmission layer **202**, and the thickness of the fourth monochromic hole transmission layer **402** is greater than the thickness of the third monochromic hole transmission layer **302**, so that the optical distance in the microcavity can be changed by adjusting the thickness of the monochromic hole transmission layer, thereby optimizing the microcavity effect. Among the thickness of the first monochromic hole transmission layer **102**, the thickness of the second monochromic hole transmission layer **202**, the thickness of the third monochromic hole transmission layer **302**, and the thickness of the fourth monochromic hole transmission layer **402**, a thickness difference between any two adjacent monochromic hole transmission layers can be equal or not be equal. As shown in FIG. **1**, the thickness of the first monochromic hole transmission layer **102** is 10 nm, the thickness of the second monochromic hole transmission layer **202** is 30 nm, the thickness of the third monochromic hole transmission layer **302** is 50 nm, and the thickness of the fourth monochromic hole transmission layer **402** is 70 nm, and the thicknesses difference between any two adjacent monochromic hole transmission layers is 20 nm. It can be understood that, the thickness of the first monochromic hole transmission layer **102**, the thickness of the second monochromic hole transmission layer **202**, the thickness of the third monochromic hole transmission layer **302**, and the thickness of the fourth monochromic hole transmission layer **402** can be other values. As shown in FIG. **1**, all the common hole transmission layers **702** can be prepared integrally to form an integrated layer. That is to say, the common hole transmission layers **702** of the light-emitting units are made of a same material.

In that case, for optimizing the microcavity effect, each of the first monochromic hole transmission layer **102**, the second monochromic hole transmission layer **202**, the third monochromic hole transmission layer **302**, and the fourth monochromic hole transmission layer **402** have an optimal thickness. Optionally, the thickness of the first monochromic hole transmission layer **102** is in a range of 9 nm-11 nm, such as 9 nm, 10 nm, 10.5 nm, and 11 nm; the thickness of the second monochromic hole transmission layer **202** is in a range of 27 nm-33 nm, such as 27 nm, 29 nm, 30 nm, 32 nm, 32.5 nm, and 33 nm; the thickness of the third monochromic hole transmission layer **302** is in a range of 45 nm-55 nm, such as 45 nm, 48 nm, 50 nm, 53 nm, 54.5 nm, and 55 nm; the thickness of the fourth monochromic hole transmission layer **402** is in a range of 63 nm-77 nm, such as 63 nm, 66 nm, 69 nm, 70 nm, 73 nm, 75 nm, and 77 nm. By using the above-mentioned configuration, the microcavity effect can be optimized, and the light intensity can be maximized, thereby improving the luminous efficiency of the organic light-emitting structure. Optionally, the thickness of the common hole transmission layer **702** is in a range of 117 nm-143 nm; a thickness of a common hole injection layer **701** is in a range of 9 nm-11 nm, such as 9 nm, 10 nm, and 11 nm; a thickness of a common electron transmission layer is in a range of 31.5 nm-38.5 nm, such as 31.5 nm, 33 nm, 35 nm, 37 nm, and 38.5 nm.

In addition, for providing enough holes for the hole transmission layer, the organic laminated body further includes a common hole injection layer **701**. In any one of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400**, the first electrode **500**, the common hole injection layer **701**, the common hole transmission layer **702**, the monochromic hole transmission layer, the common electron transmission layer **703**, and the second electrode **600** are successively stacked, that is, the common hole injection layer **701** is stacked on a surface of the first electrode **500**, the common hole transmission layer **702** is stacked on a surface of the common hole injection layer **701** away from the first electrode **500**, the monochromic hole transmission layer is stacked on a surface of the common hole transmission layer **702** away from the first electrode **500**, the common electron transmission layer **703** is stacked on a surface of the monochromic hole transmission layer away from the first electrode **500**, and the second electrode **600** is stacked on a surface of the common electron transmission layer **703** away from the first electrode **500**.

In the above-mentioned embodiments, the first electrode **500** can be an anode, the second electrode **600** can be a cathode, and the organic light-emitting structure can be in a top emission mode or in a bottom emission mode.

In the bottom emission mode, the first electrode **500** is a translucent electrode, and the second electrode **600** is a non-transparent electrode. The first electrode **500** is formed on the substrate **800**, the organic laminated body **700** is formed on a side of the first electrode **500** away from the substrate **800**, and finally, the second electrode **600** is prepared on a side of the organic laminated body **700** away from the first electrode **500**. In such organic light-emitting structure, light is extracted from one side of the anode (the first electrode **500**).

In the top emission mode, the first electrode **500** is a non-transparent anode electrode, and the second electrode **600** is a translucent cathode electrode. The first electrode **500** is formed on the substrate **800**, the organic laminated body **700** is then formed on a side of the first electrode **500** away from the substrate **800**, and finally, the second electrode **600** is formed on a side of the organic laminated body **700** away from the first electrode **500**. In such organic light-emitting structure, light is extracted from one side of the second electrode **600**.

It should be noted that, in the top emission mode, for improving the luminous efficiency of the organic light-emitting structure, each of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** further includes a reflection film **1000**. The reflection film **1000** is placed on one side of the first electrode **500** away from the organic laminated body, so that light emitted toward the substrate **800** can be reflected by the reflection film **1000** to the second electrode **600**, for improving the luminous efficiency of the organic light-emitting structure.

In the top emission mode, because of the reflection film **1000**, light emitted from the organic laminated body may direct to the reflection film **1000** and the translucent electrode, respectively; light directing to the reflection film **1000** is reflected by the reflection film **1000** and then turns to the translucent electrode; and a part of light directing to the translucent electrode passes through the translucent electrode to outside, while the other part of light directing to the translucent electrode is reflected by a surface of the translucent electrode to the reflection film **1000**. Those three parts of light interfere in each light-emitting unit (such as the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting **300**, and the fourth light-emitting unit **400**), so that the organic light-emitting structure can fully use the microcavity effect, and the luminous efficiency is improved. Therefore, preferably, the organic light-emitting structure adopts the top emission mode.

It should be understood that, light reflected by the reflection film **1000** exits from the light-emitting unit through the first electrode **500**, the organic laminated body **700**, and the second electrode **600**, so that one surface of the reflection film **1000** away from the substrate **800** is a working surface. That is to say, the surface of the reflection film **1000** away from the substrate **800** is a reflection surface. Therefore, for decreasing blockage to the light transmission, decreasing light loss of the light transmission, and better improving the luminous efficiency, the reflection film **1000** and the first electrode **500** share one interface, that is to say, the reflection film **1000** is laminated onto the first electrode **500**; while the reflection film **1000** and the substrate **800** may share one interface or may not share one interface, for example, a thin film transistor can be placed between the reflection film **1000** and the substrate **800**.

If the reflection efficiency of the reflection film **1000** is relatively small, the luminous efficiency of the organic light-emitting structure will decrease. Considering that a sensitive visible wavelength for human eyes is about 500 nm, the reflection film **1000**, whose reflectivity for a light with wavelength of 500 nm is equal to or greater than 70%, such as 70%, 75%, 80%, 85%, 88%, and 90%, is preferably selected. In that case, sufficient light can be reflected, and then shoots out from the second electrode **600**, so that an integral luminous efficiency of the organic light-emitting structure is improved. A material of the reflection film **1000** can be silver alloy, and can be formed by a sputtering coating method using a silver target material. The reflectivity of the reflection film **1000** made of silver alloy to light with wavelength of 500 nm can reach 85%.

It should be noted that, the reflectivity of the reflection film **1000** to light with wavelength of 500 nm can be smaller than 70%, and the transmissivity of the second electrode **600** to light with wavelength of 500 nm can be smaller than 20%.

In addition, the transmissivity of the translucent electrode has a significant effect on the luminous efficiency of the whole organic light-emitting structure. If the transmissivity of the translucent electrode is too small, the luminous efficiency and intensity of the whole light-emitting unit will decrease, and the luminous efficiency of the whole organic light-emitting structure will be affected. Therefore, the transmissivity of the translucent electrode to light with wavelength of 500 nm is at least 20%. For example, in the top emission mode, the transmissivity of the second electrode **600** to light with wavelength of 500 nm is at least 20%, such as 20%, 25%, 30%, 35%, and 50%, for improving the luminous efficiency of the organic light-emitting structure. The translucent cathode can be made of Mg material and Ag material, and a molar ratio of the Mg material to the Ag material can be 10:1. When the thickness of the translucent cathode is 14 nm, the transmissivity can reach 35%.

In either the top emission mode or the bottom emission mode, in each of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400**, the first electrode **500**, the second electrode **600**, the common hole injection layer **701**, the common hole transmission layer **702**, and the common electron transmission layer **703** are common layers for the four light-emitting units, thus, all the first electrodes **500** can be made together, all the second electrodes can be integrally made together, all the common hole injection layers **701** can be made together, all the common hole transmission layers **702** can be made together, and all the common electron transmission layers **703** can be made together.

In addition, at least one of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** further includes a light extraction layer **900**. Usually, each of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** includes the light extraction layer **900**. The light extraction layer **900** is covered on one side of the translucent electrode away from the organic laminated body. The luminous intensity, brightness and efficiency are adjusted by adjusting the light interference in the microcavity, so that the refractive index of the organic laminated body **700** is limited, while the refractive index of the light extraction layer **900** can be greater than the refractive index of the organic laminated body **700**. Thus, brightness of light emitted from the light-emitting unit is greater relatively. Especially in the blue-light emitting unit, the effect is more obvious. For example, the brightness of the blue-light emitting unit with the light extraction layer **900** is 10% greater than the brightness of the blue-light emitting unit without a light extraction layer. Optionally, the refractive index of the light extraction layer **900** to light with wavelength of 500 nm is greater than 1.85, so that light emitted from the organic laminated body **700** has enough brightness after passing through the translucent electrode, thereby improving the luminous efficiency of the whole organic light-emitting structure. Optionally, the thickness of the light extraction layer **900** is in a range of 54 nm-66 nm, such as 54 nm, 58 nm, 60 nm, 65 nm, 67 nm, and 68 nm. Since wavelength of blue light, wavelength of green light, wavelength of yellow light, and wavelength of red light successively increase (i.e., the wavelength of green light is greater than the wavelength of blue light, the wavelength of yellow light is greater than the wavelength of green light, and the wavelength of red light is greater than the wavelength of yellow light), it is set that the first light-emitting unit **100** is a blue-light emitting unit, the second light-emitting unit **200** is a green-light emitting unit, the third light-emitting unit **300** is a yellow-light emitting unit, and the fourth light-emitting unit **400** is a red-light emitting unit. That is to say, the material of the first light-emitting layer **101** is blue-light emitting material, the material of the second light-emitting layer **201** is green-light emitting material, the material of the third light-emitting layer **301** is yellow-light emitting material, and the material of the fourth light-emitting layer **401** is red-light emitting material. Thus, by different combinations of lights of blue, green, yellow, and red colors, abundant colors are achieved.

As described above, the luminous efficiency of the phosphorescent light-emitting material is relatively high, while the stability of the phosphorescent light-emitting material that emits blue light is poor, and the service life time thereof is short, so that when the first light-emitting unit **100** is a blue-light emitting unit, the material of the first light-emitting layer **101** is preferably the fluorescent material that emits blue light. That is to say, the first light-emitting unit **100** is a fluorescent light-emitting unit.

Considering the advantage of the luminous efficiency of the phosphorescent material, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** are selected to be phosphorescent light-emitting units. That is to say, the material of the second light-emitting layer **201** is a phosphorescent material that emits green light, the material of the third light-emitting layer **301** is a phosphorescent material that emits yellow light, and the material of the fourth light-emitting layer **401** is a phosphorescent material that emits red light, thereby improving the luminous efficiency of each light-emitting unit.

The material of the light-emitting layer of the phosphorescent light-emitting unit can be iridium compound or platinum compound. Since iridium compound includes various stable and highly effective materials emitting light in a field of from green light to yellow light, and has high luminous efficiency for green light and yellow light, materials of the second light-emitting layer **201** and third light-emitting layer **301** can include iridium compound, for further improving the luminous efficiency and brightness of the organic light-emitting structure. In addition, in that manner, the advantage of the luminous efficiency of the phosphorescent material is fully utilized to improve the luminous efficiency of the organic light-emitting structure at low power consumption.

It should be noted that, the above-described various organic light-emitting structure can be made by coating. As shown in FIG. **1**, common layers of the first light-emitting layer **100**, the second light-emitting layer **200**, the third light-emitting layer **300**, and the fourth light-emitting layer **400**, such as the substrate **800**, the first electrode **500**, the reflection film **1000** (in top emission mode), the common hole injection layer **701**, the common hole transmission layer **702**, the common electron transmission layer **703**, the second electrode **600**, and the light extraction layer **900**, can be directly prepared by coating, for example, by an integral evaporation method using a common material, that is, each common layer is shared by the four light-emitting layers, and each common layer can be integrally formed by evaporation using a same material. Different layers, such as the first light-emitting layer **101**, the second light-emitting layer **201**, the third light-emitting layer **301**, the fourth light-emitting layer **401**, the first monochromic hole transmission layer **102**, the second monochromic hole transmission layer **202**, the third monochromic hole transmission layer **302**, the fourth monochromic hole transmission layer **402**, can be made by fine mask. Openings corresponding to different layers of each light-emitting unit are defined in the fine mask. In fine mask method, the thickness of the first electrode **500** can be in a range of 9 nm-11 nm, such as 9 nm, 10 nm, and 11 nm; and the thickness of the second electrode **600** can be 12.6 nm-15.4 nm, such as 12.6 nm, 13 nm, 14 nm, 15 nm, and 15.4 nm.

Detailed preparing process is illustrated as follows:

First, preparing the substrate **800**; wherein the substrate **800** can be a glass substrate, and a thin film transistor can be directly formed on the substrate; a material of the thin film transistor can be low temperature poly-silicon, amorphous silicon, or oxide semiconductor; the oxide semiconductor can be In—Ce—Zn, In—Y—Zn, In—Ga—Zn, In—Zr—Zn, In—La—Zn, In—Nd—Zn, or In—Ga.

The pixels can be formed on the thin film transistor in advance, and four sub-pixels form a pixel. The four sub-pixels correspond to the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400**, respectively. The four sub-pixels are independent from each other, and are driven by controlling the thin film transistor. The reflection film **1000** with a thickness of 100 nm is formed on the sub-pixels by sputtering method using a silver target material. The first electrode **500** with a thickness of 10 nm is formed on the reflection film **1000** (an oxide film). It can be understood that, the reflection film **1000** can also be made of silver alloy.

The organic laminated body is prepared on the first electrode **500** by a vacuum evaporation method. The common layers are prepared by an integral evaporation method using a same material. The layers different from each other are prepared by fine mask. The different layers **100** in each of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** are respectively formed by evaporation method using different materials. At this time, openings are defined in the fine mask respectively corresponding to the sub-pixels in the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400**. Through areas of the openings, the different layers are formed by selective evaporation of needed material for each light-emitting unit. Operation is as follows:

Compound I as the material of the common hole injection layer **701** is evaporated with a thickness of 10 nm. Then, Compound II as the material of the common hole transmission layer **702** is evaporated with a thickness of 130 nm.

Next, the microcavity is prepared by different materials. In the blue-light emitting unit, Compound III as the material of the blue-light hole transmission layer is evaporated with a thickness of 10 nm, to form the first monochromic hole transmission layer **102**; in the green-light emitting unit, Compound IV as the material of the green-light hole transmission layer is evaporated with a thickness of 30 nm, to form the second monochromic hole transmission layer **202**; in the yellow-light emitting unit, Compound V as the material of the green-light hole transmission layer is evaporated with a thickness of 50 nm, to form the third monochromic hole transmission layer **302**; and in the red-light emitting unit, a Compound VI as the material of the red-light hole transmission layer is evaporated with a thickness of 70 nm, to form the fourth monochromic hole transmission layer **402**.

After that, on the above-described monochromic hole transmission layers, the first light-emitting layer **101**, the second light-emitting layer **201**, the third light-emitting layer **301**, and the fourth light-emitting layer **401** are respectively prepared by fine mask. In the blue-light emitting unit, Compound VII as the main blue-light emitting material and Compound VIII as a blue-light dopant are evaporated together, to form the first light-emitting layer **101** with a thickness of 20 nm; in the green-light emitting unit, Compound IX as the main green-light emitting material and Compound X as a green light dopant are evaporated together, to form the second light-emitting layer **201** with a thickness of 35 nm; in the yellow-light emitting unit, Compound XI as the main yellow-light emitting material and Compound XII as a yellow light dopant are evaporated together, to form the third light-emitting layer **301** with a thickness of 20 nm; and in the red-light emitting unit, a Compound XIII as the main red-light emitting material and Compound XIV as a red light dopant are evaporated together, to form the fourth light-emitting layer **401** with a thickness of 40 nm.

Then, the common electron transmission layer **703** is prepared on each light-emitting layer. Compound XV and Compound XVI are evaporated together with a ratio of 1:1, to form the common electron transmission layer **703** with a thickness of 35 nm.

Following the preparation of the common electron transmission layer **703**, the translucent cathode with a thickness of 14 nm is deposited on the common electron transmission layer **703** using Mg and Ag (with a ratio of 10:1), to form the second electrode **600**. Measuring the translucent cathode, the transmittance of the translucent cathode is 35%.

On the second electrode **600**, the light extraction layer **900** is prepared. Compound XVII is evaporated to prepare an optical adjustment common organic layer (also referred to as the light exaction layer **900**). The refractive index of the optical adjustment common organic layer on wavelength of 500 nm is 1.85.

Finally, in a dried nitrogen environment, the organic light-emitting structure is covered by a selected packaging glass, and sealed by a Frit method (a laser welding method using glass powders), to finish preparation of the whole panel. Even though the organic light-emitting structure can be sealed by UV-curable resin, a better sealing effect can be obtained by the laser welding method using glass powders.

Parameters of the organic light-emitting structure prepared by the above-described process are shown in Table 1. In Table 1, Blue refers to the first light-emitting unit **100**, Green refers to the second light-emitting unit **200**, Yellow refers to the third light-emitting unit **300**, Red refers to the fourth light-emitting unit **400**, and CIE refers to coherent infrared energy.

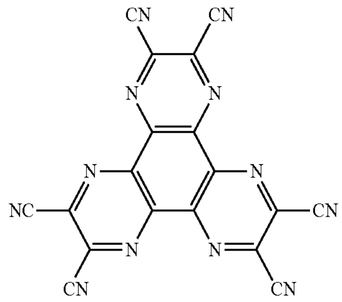
TABLE 1

	Efficiency (cd/A)	Voltage (V)	CIE	Peak value of wavelength (nm)
Blue	4	3.9	0.13, 0.05	463
Green	85	4.1	0.24, 0.73	532
Yellow	78	4.0	0.48, 0.82	560
Red	25	4.2	0.66, 0.36	615

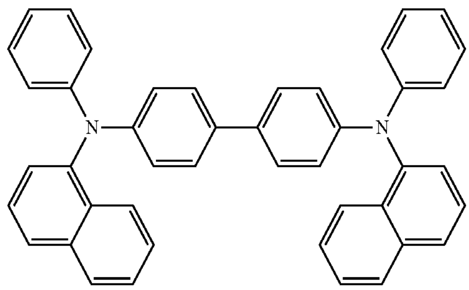
As shown in Table 1, using the organic light-emitting structure of the present disclosure, the desired luminous efficiency of each light-emitting unit can be surely obtained. At the same time, by combinations of the four kinds of light-emitting units, picture colors are richer, and picture quality is better.

Molecular formulas of compound I to compound XVII are as follows:

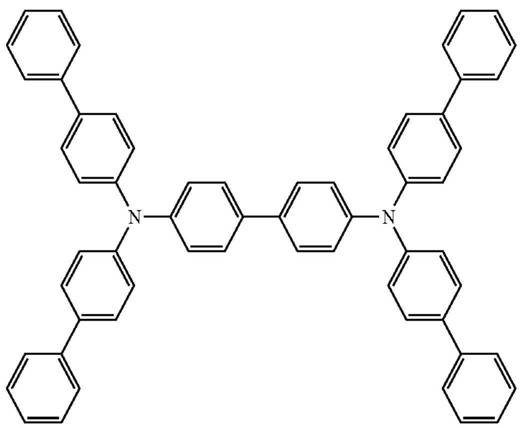
Compound I



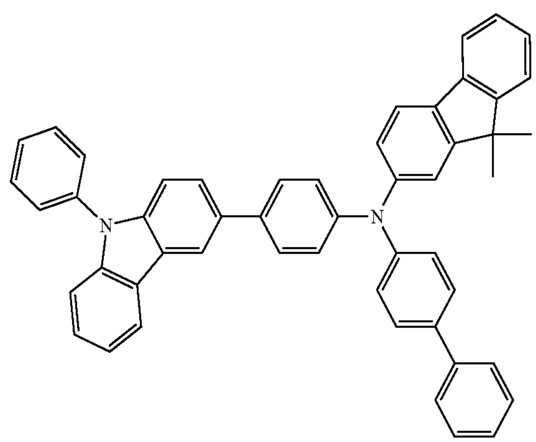
Compound II



Compound III

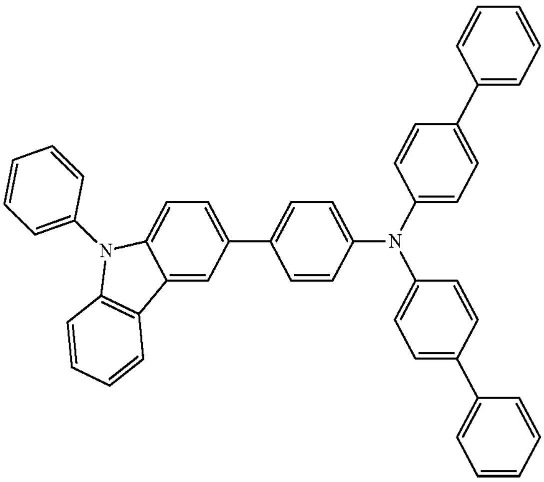


Compound IV

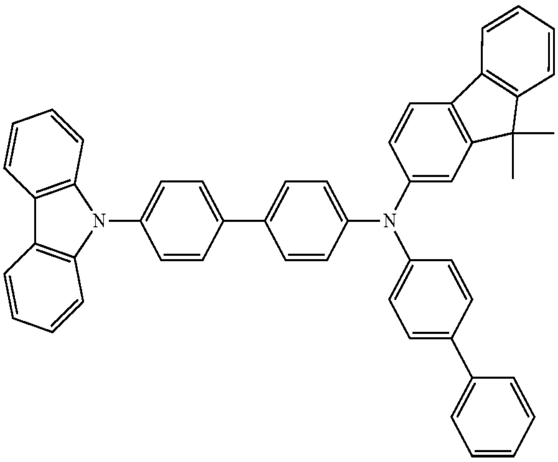


-continued

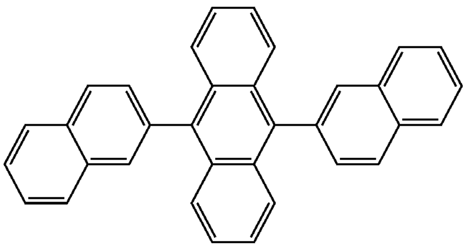
Compound V



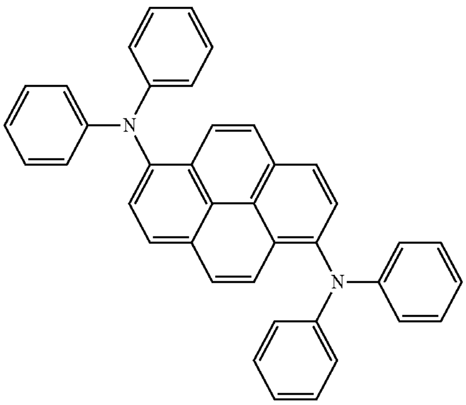
Compound VI



Compound VII

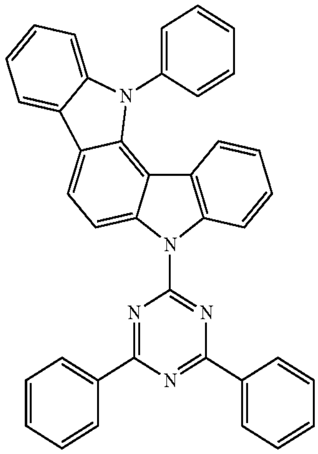


Compound VIII

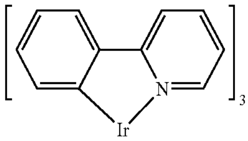


-continued

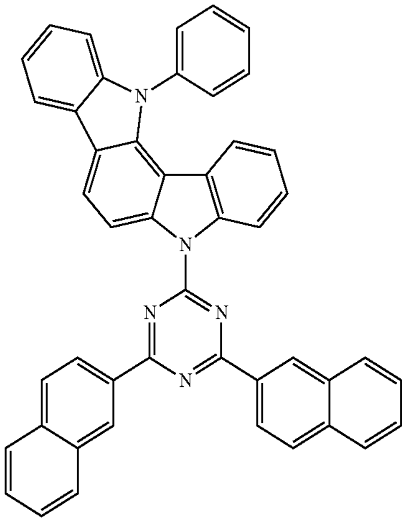
Compound IX



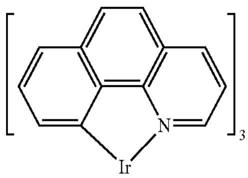
Compound X



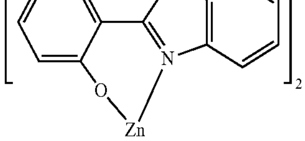
Compound XI



Compound XII

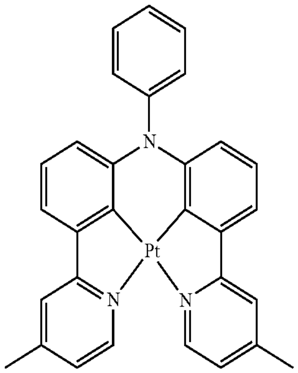


Compound XIII

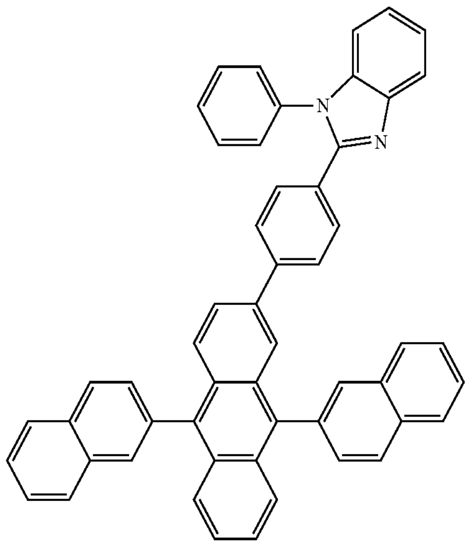


-continued

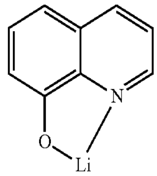
Compound XIV



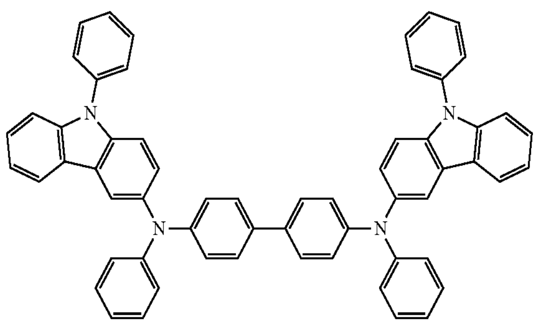
Compound XV



Compound XVI



Compound XVII



The organic light-emitting structure of the present disclosure can be formed by combination of white light and light filter. Compared with the coating method, the difference is: configuration of the organic laminated body **700** of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** is identical, and their light-emitting layers are white-light emitting layers; and each of the first light-emitting unit **100**, the second light-emitting unit **200**, the third light-emitting unit **300**, and the fourth light-emitting unit **400** includes the light filter, colors of the light filters are different from each other, and the light filter is placed on one side of the translucent electrode away from the organic laminated body **700**. The light filter of the first light-emitting unit **100** can be defined as a first light filter; the light filter of the second light-emitting unit **200** can be defined as a second light filter; the light filter of the third light-emitting unit **300** can be defined as a third light filter; and the light filter of the fourth light-emitting unit **400** can be defined as a fourth light filter. When the first light-emitting unit **100** is blue-light emitting unit, the second light-emitting unit **200** is green-light emitting unit, the third light-emitting unit **300** is yellow-light emitting unit, and the fourth light-emitting unit **400** is red-light emitting unit, the first light filter is blue light filter, the second light filter is green light filter, the third light filter is yellow light filter, and the fourth light filter is red light filter. Thus, in the first light-emitting unit **100**, by combination of the organic laminated body and the first light filter, the first light-emitting unit **100** emits blue light; in the second light-emitting unit **100**, by combination of the organic laminated body and the second light filter, the second light-emitting unit **200** emits green light; in the third light-emitting unit **300**, by combination of the organic laminated body and the third light filter, the third light-emitting unit **300** emits yellow light; in the fourth light-emitting unit **400**, by combination of the organic laminated body and the fourth light filter, the fourth light-emitting unit **400** emits red light.

In that way, the organic laminated body **700** can include, successively stacked, a hole injection layer, a first hole transmission layer stacked on a surface of the hole injection layer, a blue-light emitting layer stacked on a surface of the first hole transmission layer away from the hole injection layer, a first electron transmission layer stacked on a surface of the blue-light emitting layer away from the hole injection layer, an N-type charge generation layer stacked on a surface of the first electron transmission layer away from the hole injection layer, a P-type charge generation layer stacked on a surface of the N-type charge generation layer away from the hole injection layer, a second hole transmission layer stacked on a surface of the P-type charge generation layer away from the hole injection layer, an orange-light emitting layer stacked on a surface of the second hole transmission layer away from the hole injection layer, a second electron transmission layer stacked on a surface of the orange-light emitting layer away from the hole injection layer, and an electron injection layer stacked on a surface of the second electron transmission layer away from the hole injection layer. The hole injection layer is closer to the first electrode **500** relative to the electron injection layer. By that configuration, the blue-light emitting layer and the orange-light emitting layer connected in series with the blue-light emitting layer, are made to combine, to finally emit white light, and then the organic laminated body **700** is made to emit white light. In addition, the N-type charge generation layer **708** and the P-type charge generation layer are added in the series structure, so that electrons and holes can be provided for the two light-emitting layers. In the structure formed by the hole injection layer, the first hole transmission layer, the blue-light emitting layer, the first electron transmission layer, the N-type charge generation layer, the P-type charge generation layer, the second hole transmission layer, the orange light-emitting layer, the second electron transmission layer, and the electron injection layer, electrons are provided by the N-type charge generation layer, and holes are provided by the P-type charge generation layer. Thus, a problem of insufficient charge injection is solved, and the luminous efficiency is kept high.

In addition, the present disclosure further provides a display device. The display device includes the organic light-emitting structure as described above.

The present disclosure further provides a mobile terminal, such as cellphone. The mobile terminal includes the display device as described above.

Embodiments described above are merely preferred embodiments of the present disclosure and they do not limit the present disclosure. Any modification, equivalent replacement, and improvement made within the spirit and principle of the present disclosure shall fall into the scope of the present disclosure.

What is claimed is:

1. An organic light-emitting structure, comprising:

a first light-emitting unit,

a second light-emitting unit,

a third light-emitting unit, and

a fourth light-emitting unit,

wherein each of the first light-emitting unit, the second light-emitting unit, the third light-emitting unit, and the fourth light-emitting unit comprises a first electrode, a second electrode, and an organic laminated body placed between the first electrode and the second electrode; one of the first electrode and the second electrode is a translucent electrode; and the organic laminated body comprises a light-emitting layer; and at least one of the first light-emitting unit, the second light-emitting unit, the third light-emitting unit, and the fourth light-emitting unit is a fluorescent light-emitting unit,

wherein an emission wavelength of the first light-emitting unit, an emission wavelength of the second light-emitting unit, an emission wavelength of the third light-emitting unit, and an emission wavelength of the fourth light-emitting unit successively increase,

a thickness of the first light-emitting layer is in a range of 18 nm-22 nm, a thickness of the second light-emitting layer is in a range of 31.5 nm-38.5 nm, a thickness of the third light-emitting layer is in a range of 31.5 nm-38.5 nm, and a thickness of the fourth light-emitting layer is in a range of 36 nm-44 nm,

the organic laminated body further comprises a monochromic hole transmission layer stacked with the light-emitting layer, the light-emitting layer is closer to the translucent electrode than the monochromic hole transmission layer is;

the monochromic hole transmission layer of the first light-emitting unit is a first monochromic hole transmission layer, the monochromic hole transmission layer of the second light-emitting unit is a second monochromic hole transmission layer, the monochromic hole transmission layer of the third light-emitting unit is a third monochromic hole transmission layer, and the monochromic hole transmission layer of the fourth light-emitting unit is a fourth monochromic hole transmission layer;

the first monochromic hole transmission layer, the second monochromic hole transmission layer, the third monochromic hole transmission layer and the fourth monochromic hole transmission layer are made of different electron-resistant materials;

a thickness of the first monochromic hole transmission layer is in a range of 9 nm-11 nm, a thickness of the second monochromic hole transmission layer is in a range of 27 nm-33 nm, a thickness of the third monochromic hole transmission layer is in a range of 45 nm-55 nm, and a thickness of the fourth monochromic hole transmission layer is in a range of 63 nm-77 nm, and

the organic laminated body further comprises a common hole transmission layer, the common hole transmission layer is stacked on one side of the monochromic hole transmission layer away from the light-emitting layer, and the common hole transmission layer and the monochromic hole transmission layer are made of different materials.

2. The organic light-emitting structure according to claim **1**, wherein an emission wavelength of the first light-emitting unit, an emission wavelength of the second light-emitting unit, an emission wavelength of the third light-emitting unit, and an emission wavelength of the fourth light-emitting unit successively increase.

3. The organic light-emitting structure according to claim **2**, wherein the light-emitting layer of the first light-emitting layer is a first light-emitting layer, the light-emitting layer of the second light-emitting layer is a second light-emitting layer, the light-emitting layer of the third light-emitting layer is a third light-emitting layer, and the light-emitting layer of the fourth light-emitting layer is a fourth light-emitting layer.

4. The organic light-emitting structure according to claim **1**, wherein the first electrode is a non-transparent anode; and the second electrode is a translucent cathode.

5. The organic light-emitting structure according to claim **4**, wherein each of the first light-emitting unit, the second light-emitting unit, the third light-emitting unit, and the fourth light-emitting unit further comprises a reflection film, and the reflection film is placed on one side of the first electrode away from the organic laminated body.

6. The organic light-emitting structure according to claim **5**, further comprising:

a substrate;

wherein the substrate, the reflection film, and the first electrode are stacked up, and the reflection film is laminated onto the first electrode.

7. The organic light-emitting structure according to claim **5**, wherein a transmissivity of the translucent electrode to light with a wavelength of 500 nm is at least 20%; and a reflectivity of the reflection film to light with a wavelength of 500 nm is greater than or equal to 70%.

8. The organic light-emitting structure according to claim **5**, wherein at least one of the first light-emitting unit, the second light-emitting unit, the third light-emitting unit, and the fourth light-emitting unit further comprises a light extraction layer, the light extraction layer covers one side of the translucent electrode away from the organic laminated body; and a refractive index of the light extraction layer to light with a wavelength of 500 nm is greater than 1.85.

9. The organic light-emitting structure according to claim **1**, wherein a material of a light-emitting layer of the phosphorescent light-emitting unit is iridium compound or platinum compound.

10. A display device, comprising an organic light-emitting structure, wherein the organic light-emitting structure comprises:

a first light-emitting unit,

a second light-emitting unit,

a third light-emitting unit, and

a fourth light-emitting unit,

wherein each of the first light-emitting unit, the second light-emitting unit, the third light-emitting unit, and the fourth light-emitting unit comprises a first electrode, a second electrode, and an organic laminated body placed between the first electrode and the second electrode; one of the first electrode and the second electrode is a translucent electrode; and the organic laminated body comprises a light-emitting layer; and at least one of the first light-emitting unit, the second light-emitting unit, the third light-emitting unit, and the fourth light-emitting unit is a fluorescent light-emitting unit,

wherein an emission wavelength of the first light-emitting unit, an emission wavelength of the second light-emitting unit, an emission wavelength of the third light-emitting unit, and an emission wavelength of the fourth light-emitting unit successively increase,

a thickness of the first light-emitting layer is in a range of 18 nm-22 nm, a thickness of the second light-emitting layer is in a range of 31.5 nm-38.5 nm, a thickness of the third light-emitting layer is in a range of 31.5 nm-38.5 nm, and a thickness of the fourth light-emitting layer is in a range of 36 nm-44 nm,

the organic laminated body further comprises a monochromic hole transmission layer stacked with the light-emitting layer, the light-emitting layer is closer to the translucent electrode than the monochromic hole transmission layer is;

the monochromic hole transmission layer of the first light-emitting unit is a first monochromic hole transmission layer, the monochromic hole transmission layer of the second light-emitting unit is a second monochromic hole transmission layer, the monochromic hole transmission layer of the third light-emitting unit is a third monochromic hole transmission layer, and the monochromic hole transmission layer of the fourth light-emitting unit is a fourth monochromic hole transmission layer; and

the first monochromic hole transmission layer, the second monochromic hole transmission layer, the third monochromic hole transmission layer and the fourth monochromic hole transmission layer are made of different electron-resistant materials;

a thickness of the first monochromic hole transmission layer is in a range of 9 nm-11 nm, a thickness of the second monochromic hole transmission layer is in a range of 27 nm-33 nm, a thickness of the third monochromic hole transmission layer is in a range of 45 nm-55 nm, and a thickness of the fourth monochromic hole transmission layer is in a range of 63 nm-77 nm, and

the organic laminated body further comprises a common hole transmission layer, the common hole transmission layer is stacked on one side of the monochromic hole transmission layer away from the light-emitting layer, and the common hole transmission layer and the monochromic hole transmission layer are made of different materials.

11. The organic light-emitting structure according to claim **1**, wherein the at least one of the first light-emitting unit, the second light-emitting unit, the third light-emitting unit, and the fourth light-emitting unit is the fluorescent light-emitting unit, and each of the rest of the first light-emitting unit, the second light-emitting unit, the third light-emitting unit, and the fourth light-emitting unit is a phosphorescent light-emitting unit.

12. The organic light-emitting structure according to claim **1**, wherein the first light-emitting unit is a blue-light emitting unit; the second light-emitting unit is a green-light emitting unit; the third light-emitting unit is a yellow-light emitting unit; and the fourth light-emitting unit is a red-light emitting unit.

13. The organic light-emitting structure according to claim **12**, wherein the first light-emitting unit is a fluorescent light-emitting unit.

14. The organic light-emitting structure according to claim **13**, wherein each of the second light-emitting unit, the third light-emitting unit, and the fourth light-emitting unit is a phosphorescent light-emitting unit.

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专利名称(译)	有机发光结构和显示装置		
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摘要(译)

描述了有机发光结构。 有机发光结构包括第一发光单元，第二发光单元，第三发光单元和第四发光单元。 第一发光单元，第二发光单元，第三发光单元和第四发光单元中的每一个包括第一电极，第二电极以及置于第一电极和第二电极之间的有机层压体。 第二电极。 第一电极和第二电极中的一个是半透明电极。 至少一个发光单元是荧光发光单元。 增加了有机发光结构的色域范围，提高了发光器件的色饱和度，并且增加了颜色数量，从而可以满足显示装置的颜色再现性的发展趋势。