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(54) **COLOR CONVERSION ELEMENT AND DISPLAY DEVICE INCLUDING THE SAME**

FARBUMWANDLUNGSELEMENT UND ANZEIGEVORRICHTUNG DAMIT

ÉLÉMENT DE CONVERSION DE COULEURS ET DISPOSITIF D'AFFICHAGE LE COMPRENANT

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Description

BACKGROUND

1. Field

[0001] The present disclosure relates to a colour conversion element and a display device including the same.

2. Description of the Related Art

[0002] A display device may include a colour conversion element for receiving light from a light source, e.g., an organic light emitting element or the like, and implementing a colour. The colour conversion element may be disposed on a display device in the form of a separate substrate or may be integrated directly with elements in the display device.

[0003] As an example, the colour conversion element may receive blue light from a light source and emit blue light, green light, and red light, respectively, thereby allowing an image having various colours to be viewed. In this case, a region expressing a blue colour in the colour conversion element may be configured to emit the blue light provided by the light source as it is.

[0004] WO2011027712 describes a color filter substrate for an organic EL display device, which enables the satisfactory curing of a photocurable resin formed between a color filter and an organic EL display device upon the irradiation with ultraviolet ray; and an organic EL display device. Specifically disclosed is an organic EL display device, in which an organic EL element substrate having organic elements formed therein and a color filter substrate having multiple color filter layers formed therein are adhered to each other through an adhesive layer comprising a photocurable resin, wherein the multiple color filter layers are so arranged as to correspond to the organic EL elements. On a part of pixel regions that form the color filter layers, an ultraviolet-ray-transmittable region through which ultraviolet ray can be transmitted for curing the photocurable resin is provided.

SUMMARY

[0005] According to an aspect of the invention, there is provided a colour conversion element according to claim 1.

[0006] Optional features of the colour conversion element are provided in dependent claim 2 to 8.

[0007] According to another aspect of the invention, there is provided a display device according to claim 9.

[0008] Optional features of the display device are provided in dependent claim 10.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Features will be made apparent to those of skill in the art by describing in detail embodiments with reference to the attached drawings, in which:

FIG. 1 illustrates a schematic view of a planar shape of a colour conversion element not claimed but useful for understanding the present disclosure;
FIG. 2 illustrates a sectional view taken along line II-II' of FIG. 1;
FIG. 3 illustrates a sectional view of a display device not claimed but useful for understanding the present disclosure;
FIGS. 4 and 7-12 illustrate sectional views of colour conversion elements not claimed but useful for understanding the present disclosure whereas figures 5, 13 and 14 disclose colour conversion elements as claimed.
FIG. 12 illustrates a sectional view of a display device not claimed but useful for understanding the present disclosure; and
FIGS. 13 and 14 illustrate sectional views of colour conversion elements useful for understanding the present disclosure.

DETAILED DESCRIPTION

[0010] Example embodiments will now be described more fully hereinafter with reference to the accompanying drawings; however, the invention may be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and and will convey implementations to those skilled in the art.

[0011] In the drawing figures, the dimensions of layers and regions may be exaggerated for clarity of illustration. It will also be understood that when a layer or element is referred to as being "on" another layer or substrate, it can be directly on the other layer or substrate, or intervening layers may also be present. Further, it will be understood that when a layer is referred to as being "connected to" or "coupled to" another layer, it can be directly connected or coupled, or one or more intervening layers may also be present. In addition, it will also be understood that when a layer is referred to as being "between" two layers, it can be the only layer between the two layers, or one or more intervening layers may also be present. In contrast, when an element is referred to as being "directly on," "directly connected to" or "directly coupled to" another element or layer, there are no intervening elements or layers present. As used herein, connected may refer to elements being physically, electrically and/or fluidly connected to each other. Like reference numerals refer to like elements throughout.

[0012] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting. As used herein, the singular forms "a," "an" and "the" are intended to include the plural forms as well, including "at least one," unless the context clearly indicates otherwise. It will be further understood that the terms "comprises," "comprising," "includes" and/or "including," when used in this specification, specify the presence of stated features, integers, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof "At least one" is not to be construed as limiting "a" or "an." "Or" means "and/or." As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0013] It will be understood that, although the terms first, second, third, etc., may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section from another element, component, region, layer or section. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of the disclosure.

[0014] Spatially relative terms, such as "beneath," "below," "lower," "above," "upper" and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "below" or "beneath" other elements or features would then be oriented "above" the other elements or features. Thus, the exemplary term "below" can encompass both an orientation of above and below.

[0015] Hereinafter, embodiments of the present disclosure will be described with reference to the attached drawings.

[0016] FIG. 1 is a schematic view illustrating a planar shape of a colour conversion element 10 not claimed, and FIG. 2 is a sectional view taken along line II-II' of FIG. 1.

[0017] Referring to FIGS. 1 and 2, the colour conversion element 10 not claimed may include a base substrate 300, a light blocking member BM, a colour filter layer 410B, and colour conversion layers 410G and 410R. Hereinafter, the colour filter layer 410B with the colour conversion layers 410G and 410R may be referred to as the colour filter and conversion layers 410B, 410G, and 410R. In the colour conversion element 10, planar light transmitting regions Rb, Rg, and Rr, and a light blocking region BR are defined depending on the arrangement position of the light blocking member BM.

[0018] The base substrate 300 may support the components of the colour conversion element 10 by providing a space in which the light blocking member BM, the colour filter layer 410B, and the like may be disposed. The base substrate 300 may be a light transmitting substrate. The light transmitting regions Rb, Rg, and Rr and light blocking region BR of the colour conversion element 10 may be defined on one side of the base substrate 300. The colour conversion element 10 may be coupled to a display element 20 such that the upper portion thereof faces the display element 20 based on FIG. 2, as illustrated in FIG. 3. In this case, the light provided from the display element 20 may be transmitted from the upper surface of the base substrate 300 to the lower surface thereof based on FIG. 2. That is, as illustrated in FIG. 3, light L1 emitted from the display element 20 may be incident on the colour filter and conversion layers 410B, 410G, and 410R of the colour conversion element 10 and continue toward and through the base substrate 300.

[0019] The light blocking member BM may be disposed on the base substrate 300. A region overlapping with a portion where the light blocking member BM is disposed may be defined as a light blocking region BR, i.e., a region in which the transmission of visible light is substantially blocked, and a region overlapping with a portion where the light blocking member BM is not disposed may be defined as light transmitting regions Rb, Rg, and Rr.

[0020] The light blocking member BM may be disposed in a predetermined pattern. For example, the light blocking member BM may have a pattern of a type arranged between adjacent layers of the plurality of colour filter and conversion layers 410B, 410G and 410R. Further, as illustrated in FIG. 1, when the plurality of colour filter and conversion layers 410B, 410G and 410R are arranged in a matrix shape on a plane, the light blocking members BM may be arranged in a matrix line shape crossing therebetween, e.g., the light blocking members BM may have a pattern of a frame surrounding a grid to separate adjacent colour filter and conversion layers 410B, 410G and 410R from each other in two directions.

[0021] The light blocking member BM may contain a material having a high absorption rate for visible light. The light blocking member BM may contain a metal, e.g., chromium, a metal nitride, a metal oxide, or a resin material coloured in black, but the present disclosure is not limited thereto.

[0022] The light blocking member BM can prevent colour mixing from occurring between the adjacent colour filter and conversion layers 410B, 410G, and 410R. Therefore, the light blocking member BM may improve colour reproducibility and the like.

[0023] The plurality of colour filter and conversion layers 410B, 410G, and 410R may be disposed in a region where the light blocking member BM on the base substrate 300 is not disposed. However, the present disclosure is not limited thereto, and some of the colour filter and conversion layers 410B, 410G, and 410R may be disposed on the light blocking member BM to overlap a part of the light blocking member BM.

[0024] The colour filter and conversion layers 410B, 410G, and 410R may be spaced apart from each other by a predetermined distance. However, the present disclosure is not limited thereto. For example, as shown in

FIGS. 4 to 6, some of the layers may be disposed to be in contact with each other or overlap each other.

[0025] The plurality of colour filter and version layers 410B, 410G, and 410R are divided into a first colour filter layer 410B, a second colour conversion layer 410G, and a third colour conversion layer 410R. The first colour filter layer 410B, the second colour conversion layer 410G and the third colour conversion layer 410R are arranged in a predetermined order. In the drawings, the first colour filter layer 410B, the second colour conversion layer 410G and the third colour conversion layer 410R are arranged in this order in a row direction. However, the arrangement order or arrangement rule of the respective layers is not limited thereto.

[0026] The first colour filter layer 410B is arranged to receive light and emit light of a first colour. Specifically, the first colour filter layer 410B may be a layer selectively transmitting only the wavelength of the first colour of the provided light. The light of the first colour may be blue light having a wavelength of about 450 nm to 495 nm. However, it should be understood that the blue wavelength is not limited to the above example, and includes all the wavelength ranges that can be perceived as blue in the art.

[0027] The first colour filter layer 410B may be a layer in which a colourant P having the first colour is dispersed in a transparent organic film. The colourant P may be a pigment, a dye, or a mixture thereof. That is, the first colour filter layer 410B may be a layer containing at least one of a pigment having the first colour and a dye having the first colour. However, the present disclosure is not limited thereto, and the first colour filter layer 410B may be formed of an organic film having a colour transmitting only the wavelength of the first colour.

[0028] The first colour filter layer 410B may further contain a scattering agent S dispersed in the first colour filter layer 410B. The scattering agent S may scatter the light incident on the first colour filter layer 410B to allow the front and side luminance of the light emitted from the first colour filter layer 410B to be uniform, thereby improving the viewing angle of a display device including the colour conversion element 10. The scattering agent S is not particularly limited as long as it can uniformly scatter light, and examples thereof may include nanoparticles of SiO_2, TiO_2, ZrO_2, Al_2O_3, In_2O_3, ZnO, SnO_2, Sb_2O_3,and ITO. The content of the scattering agent S is not particularly limited, but may be included in an amount of 1 vol% or more of the first colour filter layer 410B, e.g., about 1 vol% to about 11 vol%, in order to achieve a substantial light dispersion effect.

[0029] Meanwhile, the first colour filter layer 410B is not limited to a configuration for filtering a specific wavelength. The first colour filter layer 410B may be a light scattering layer in which the scattering agent S is dispersed in a transparent organic film. In this case, the light scattering layer can serve only to uniformly scatter the provided light.

[0030] The second colour conversion layer 410G may serve to receive light and emit light of a second colour. Specifically, the second colour conversion layer 410G may be a layer converting the provided light into a wavelength of the second colour. The light of the second colour may be green light having a wavelength of about 495 nm to 570 nm. However, it should be understood that the green wavelength is not limited to the above example, and includes all the wavelength ranges that can be perceived as blue in the art.

[0031] The second colour conversion layer 410G may include a second colour conversion medium layer 430G and a cutting layer 420G. FIG. 2 shows a structure in which a second colour conversion medium layer 430G is laminated on the cutting layer 420G.

[0032] The second colour conversion medium layer 430G may convert the provided light into the second colour. The second colour conversion medium layer 430G may contain a colour conversion material dispersed in the second colour conversion medium layer 430G, e.g., a quantum dot (QD), a fluorescent material, or a phosphorescent material.

[0033] The quantum dot, which is an example of a colour conversion material, is a material having a crystal structure of several nanometres in size, is composed of hundreds to thousands of atoms, and exhibits a quantum confinement effect in which an energy band gap is increased due to a small size. When light having a wavelength higher than the band gap is incident on the quantum dot, the quantum dot is excited by absorbing the light and falls to a ground state while emitting light of a specific wavelength. The emitted light of the specific wavelength has a value corresponding to the band gap. The quantum dot can control the luminescence characteristics due to the quantum confinement effect by adjusting the size and composition thereof.

[0034] The quantum dot may contain at least one of group II -VI compounds, group II-V compounds, group III-VI compounds, group III-V compounds, group IV-VI compounds, group I-III-VI compounds, group II-IV-VI compounds, and group II-IV-V compounds. The quantum dot may include a core and a shell overcoating the core. Examples of the core may include, but are not limited to, CdS, CdSe, CdTe, ZnS, ZnSe, ZnTe, GaN, GaP, GaAs, GaSb, AlN, AlP, AlAs, AlSb, InP, InAs, InSb, SiC, Ca, Se, In, P, Fe, Pt, Ni, Co, Al, Ag, Au, Cu, FePt, Fe_2O_3, Fe_3O_4, Si, and Ge. Examples of the shell may include, but are not limited to, ZnS, ZnSe, ZnTe, CdS, CdSe, CdTe, HgS, HgSe, HgTe, AlN, AlP, AlAs, AlSb, GaN, GaP, GaAs, GaSb, GaSe, InN, InP, InAs, InSb, TlN, TlP, TlAs, TlSb, PbS, PbSe, and PbTe.

[0035] When light is incident on the colour conversion material, and then its wavelength is converted and emitted, its emission direction has random scattering characteristics. Accordingly, the second colour conversion layer 410G containing such a colour conversion material may have uniform front and side luminance of light emitted from the second colour conversion layer 410G even if it does not contain an additional scattering agent. However, the second colour conversion layer 410G may further contain the scattering agent S for more uniformly controlling the viewing angle of the emitted light.

[0036] The cutting layer 420G may be a layer that blocks the transmission of light of a specific wavelength. As described above, the colour conversion element 10 may be coupled with the display element 20 such that the upper portion thereof faces the display element 20 based on FIG. 2. In this case, the light emitted from the display element 20 may be first incident on the second colour conversion medium layer 430G, converted into the wavelength of the second colour, and then incident on the cutting layer 420G. At this time, a part of the light incident on the second colour conversion medium layer 430G may pass through the second colour conversion medium layer 430G without passing through the colour conversion material. In this case, the cutting layer 420G can block such light to improve the colour purity of light emitted from the second colour conversion layer 410G.

[0037] The light emitted from the display element 20 may have a wavelength substantially the same as the first colour, and the cutting layer 420G may be a first colour cutting layer 420G. The first colour cutting layer 420G may be formed of an organic film having a yellow colour. However, the present disclosure is not limited thereto, and the first colour cutting layer 420G may also be formed of an organic film having a green colour. That is, the first colour cutting layer 420G may contain any material that can block the first colour light.

[0038] The third colour conversion layer 410R, similarly to the second conversion layer 410G, may serve to receive light and emit light of a third colour. Specifically, the third colour conversion layer 410R may be a layer converting the provided light into a wavelength of the third colour. The light of the third colour may be red light having a wavelength of about 620 nm to 750 nm. However, it should be understood that the green wavelength is not limited to the above example, and includes all the wavelength ranges that can be perceived as blue in the art.

[0039] The third colour conversion layer 410R may include a third colour conversion medium layer 430R and a cutting layer 420R. Since the third colour conversion medium layer 430R and the cutting layer 420R haven been described as described above in the description of the second colour conversion layer 410G, a redundant description will be omitted. The third colour conversion medium layer 430R may contain a colour conversion material such as a quantum dot capable of converting the provided light into a third colour. When the cutting layer 420R of the third colour conversion layer 410R is a layer blocking the first colour, the cutting layer 420R may be formed of an organic film having a red colour. However, the present disclosure is not limited thereto, and the cutting layer 420R may be formed of an organic film having a yellow colour. Both the cutting layer 420G of the second colour conversion layer 410G and the cutting layer 420R of the third colour conversion layer 410R may be organic films having a yellow colour, but the present disclosure is not limited thereto.

[0040] In the light transmitting regions Rb, Rg and Rr, the region where the first colour filter layer 410B is disposed may be defined as a first colour region Rb, the region where the second colour conversion layer 410G is disposed may be defined as a second colour region Rg, and the region where the third colour conversion layer 410R is disposed region may be defined as a third colour region Rr. The first, second, and third colour regions Rb, Rg, and Rr may be regions that receive light and emit first, second, and third colour light, respectively.

[0041] Although the second colour conversion layer 410G and the third colour conversion layer 410R are entirely disposed in the second colour region Rg and the third colour region Rr, respectively, the first colour filter layer 410B may be disposed only in a part of the first colour region Rb. That is, as illustrated in FIG. 1, the second and third colour regions Rg and Rr are filled with the regions where the second or third colour conversion layers 410G and 410R are disposed, whereas the first colour region Rb is arranged to include both the region Rb2 where the first colour filter layer 410B is disposed and the region Rb1 where the first colour filter layer 410B is not disposed. Therefore, a part of the light incident on the first colour region Rb may pass through the first colour filter layer 410B, and a remaining part thereof may pass through the colour conversion element 10 without passing through the first colour filter layer 410B.

[0042] Expressing the arrangement relationship between the first colour filter layer 410B and the second and third colour conversion layers 410G and 410R again, the first colour filter layer 410B, second colour conversion layer 410G, and the third colour conversion layers 410R are sequentially arranged on a plane. The interval between the first colour filter layer 410B and the second colour conversion layer 410G or the interval between the first colour filter layer 410B and the third colour conversion layer 410R may be different from the interval between the second colour conversion layer 410G and the third colour conversion layer 410R. For example, as illustrated in FIG. 2, the horizontal interval D1 between the first colour filter layer 410B and the third colour conversion layer 410R may be larger than the horizontal interval D2 between the second and third colour conversion layers 410G and 410R due to the small horizontal width of the first colour filter layer 410B relative to those of the second and third colour conversion layers 410G and 410R, e.g., to allow for the exposed region Rb1 discussed above. Further, the area of the first colour filter layer 410B contacting (or overlapping) the base substrate 300 may be different from the area of the second colour conversion layer 410G or the third colour conversion layer 410R contacting (or overlapping) the base substrate 300, e.g., due to the small horizontal width of the first colour filter layer 410B relative to those of the second and third colour conversion layers 410G and 410R (FIGS. 1-2).

[0043] If the entire light incident on the first colour region Rb were to pass through the first colour filter layer 410B, the viewing angle and colour purity would be improved, but the luminance would be lowered due to the light loss occurring when the light passes through the first colour filter layer 410B. On the other hand, if the first colour filter layer 410B were not provided, the light incident on the first colour region Rb would be emitted to the outside while maintaining luminance, but would be disadvantageous in terms of viewing angle and colour purity. That is, luminance and viewing angle/colour purity can form a trade-off relationship.

[0044] Therefore, improvement of luminance is an important factor in the display device product depending on its size or purpose, and/or improvement of a viewing angle or colour purity is an important factor as well. As such, the first colour filter layer 410B is arranged only in a necessary portion of the first colour region Rb, thereby setting the balance between the luminance and the viewing angle/colour purity to a required level. That is, as discussed previously, the first colour filter layer 410B is arranged to filter incident light in the region Rb1, but not arranged to filter incident light in the region Rb2, in order to balance between the luminance and the viewing angle/colour purity.

[0045] In other words, the first colour filter layer 410B, unlike the second or third conversion layer 410G or 41 0R, may be formed in only a part of the first colour region Rb by partially changing the shape of an exposure mask used for forming the second or third colour conversion layers 410G or 410R or by adjusting an exposure amount. However, the method of forming the first colour filter layer 410B is not limited thereto.

[0046] The colour conversion element 10 may further include a protective layer 500 disposed to cover the plurality of colour filter and conversion layers 410B, 410G, and 410R. The protective layer 500 may serve to seal and protect elements such as the colour filter and conversion layers 410B, 410G, and 410R. In particular, since the colour conversion material, e.g., a quantum dot, contained in the colour conversion thereby setting the balance between the luminance and the viewing angle/colour purity to a required level on layers 410G and 410R is vulnerable to oxygen, moisture, or the like, it is possible to effectively protect the components of the colour conversion element 10 by forming the protection layer 500 made of a material resistant to moisture. The protective layer 500 may be made of a transparent material that substantially transmits visible light.

[0047] FIG. 3 is a sectional view of a display device not claimed. Referring to FIG. 3, a display device may include the display element 20 and the colour conversion device 10 facing the display element 20. Since the colour conversion element 10 shown in FIG. 3 is substantially the same as the colour conversion element 10 shown in FIGS. 1 and 2, hereinafter, a detailed description of the colour conversion device 10 will be omitted.

[0048] The display element 20 may include a support substrate 100 and a light emitting element 200. In the display element 20, a plurality of pixels may be defined on a plane.

[0049] The support substrate 100 may be a driving substrate including a wiring for driving the display element 20, an electrode, a semiconductor, an insulating film, or the like, which provides a space where the light emitting element 200 is disposed. The light emitting element 200 may include a first electrode 210, a pixel defining layer 220, a light emitting layer 230, and a second electrode 240.

[0050] The first electrode 210 may be disposed on the support substrate 100. The first electrode 210 may be disposed in a region corresponding to each pixel of the display element 20. The first electrode 210 may be a pixel electrode or an anode electrode of the display element 20.

[0051] The pixel defining layer 220 may be disposed on the support substrate 100. The pixel defining layer 220 may define a plurality of pixels on the display element 20 through openings. The opening may expose at least a part of the first electrode 210 for each pixel.

[0052] The light emitting layer 230 may be disposed on the first electrode 210 exposed by the opening. The light emitting layer 230 may be an organic light emitting layer containing an organic material that emits light by the formation of excitons of holes and electrons. In this case, the light emitting element 200 and the display element 20 may be referred to as an organic light emitting element and an organic light emitting display element, respectively. The light emitting layer 230 may further include at least one of a hole injecting layer, a hole transporting layer, an electron transporting layer, and an electron injecting layer.

[0053] The second electrode 240 may be disposed on the light emitting layer 230. The second electrode 240 may be disposed to cover both the light emitting layer 230 and the pixel defining layer 220. The second electrode 240 may be a common electrode or cathode electrode of the display element 20.

[0054] The display element 20 may further include a capping layer 250 disposed to seal the light emitting device 200 to prevent external foreign matter or moisture from penetrating into the organic layer.

[0055] The light emitted from the light emitting layer 230 may pass through the second electrode 240, made of a transparent material, and through the capping layer 250, and may be provided to the front side, i.e., to be incident on the colour conversion element 10 disposed on the upper side with reference to FIG. 3. In the display element 20, the region where light is emitted by the light emitting layer 230 may be defined as a light emitting region ER, and the region where the light emitting layer 230 is not disposed may be defined as a non-light emitting region NER.

[0056] As described above, as the display element 20, an organic light emitting display element including the organic light emitting layer 230 has been exemplified, but the present disclosure is not limited thereto. The display element 20 may be a liquid crystal display element that selectively transmits light provided from a backlight assembly including a light source and provides the light to the colour conversion element 10.

[0057] The colour conversion element 10 may be disposed such that the base substrate 300 is disposed on the upper side of FIG. 3, so the plurality of colour filter and conversion layers 410B, 410G, 410R face the display element 20. The plurality of light transmitting regions Rb, Rg, and Rr of the colour conversion element 10 may correspond to the plurality of pixels of the display element 20 at a ratio of 1:1, and the light blocking region BR of the colour conversion element 10 may correspond to the non-light emitting region NER of the display element 20. The area of each of the light transmitting regions Rb, Rg and Rr may be substantially the same as the area of the light emitting region ER (or the area of the light blocking region BR and the area of the non-light emitting region NER), but the present disclosure is not limited thereto.

[0058] As described above, since the first colour is disposed only in a part of the first colour region Rb, a first part of the light L1 incident on the first colour region Rb may pass through the first colour filter layer 410B, and a remaining part thereof, i.e., a second part of light L1 different from the first part, may pass through the colour conversion element 10 without passing through the first colour filter layer 410B. As described above, light L2 not passing through the first colour filter layer 410B is advantageous in terms of luminance, but is disadvantageous in terms of a viewing angle/colour purity compared to light L3 passing through the first colour filter layer 410B.

[0059] The light emitting layer 230 disposed in each pixel may emit light of the same colour or wavelength to each other, and more specifically, emit the first colour light. However, the present disclosure is not limited thereto, and the first colour light emitted from the light emitting layer 230 and the first colour light emitted from the first colour filter layer 410B may be partially different from each other in a specific wavelength range.

[0060] In the first colour light emitted from the light emitting layer 230 of the display element 20, the light provided to the first colour region Rb of the colour conversion element 10 may be emitted to the outside while maintaining the first colour, and the light provided to the second and third colour regions may be converted into second and third colours through the second and third colour conversion layers, respectively, and emitted to the outside. At least a part of the light L2 emitted from the light emitting layer 230 passes through the colour conversion element 10 through a region of the first colour region Rb where the first colour filter layer 410B is not disposed, so that luminance may not be lost. The viewing angle, colour purity, and the like of the light L3 passing through the first colour filter layer 410B of the first colour region Rb can be improved.

[0061] The first colour light may be blue light having a wavelength of about 450 nm to 495 nm, the second colour light may be green light having a wavelength of about 495 nm to 570 nm, and the third colour light may be red light having a wavelength of about 620 nm to 750 nm. However, the blue, green, and red wavelengths are not limited to the above examples, and should be understood to include all wavelength ranges that can be recognized in the art as blue, green, and red.

[0062] FIG. 4 is a sectional view of a colour conversion element 11 not claimed. The colour conversion element 11 of FIG. 4 is the same as the colour conversion element 10 of FIGS. 1 and 2, except that the first colour filter layer 411B is disposed in substantially the same size as the second colour conversion layer 410G or the third colour conversion layer 410R. Hereinafter, redundant contents will be omitted, and differences will be mainly described.

[0063] Referring to FIG. 4, the first colour filter layer 411B may be disposed in substantially the same size as the second colour conversion layer 410G or the third colour conversion layer 410R. That is, the planar area of the first colour filter layer 41 1B may be substantially the same as that of the second colour conversion layer 410G or the third colour conversion layer 410R, as viewed in top view.

[0064] In this case, the area of the first colour filter layer 410B contacting the base substrate 300 may be different from the area of the second colour conversion layer 410G or the third colour conversion layer 410R contacting the base substrate 300, but the area of the first colour filter layer 410B overlapping the base substrate 300 may be the same as the area of the second colour conversion layer 410G or the third colour conversion layer 410R overlapping the base substrate 300. Accordingly, the colour conversion element 11 may have a shape in which the first colour filter layer 410B having the same size as the second and third colour conversion layers 410G and 410R is shifted in one direction.

[0065] The first colour filter layer 411B having such a shape can be formed by simply changing the alignment of an exposure mask used for forming the second and third colour conversion layers 410G and 410R by a predetermined interval in addition to the above-mentioned method.

[0066] Further, the first colour filter layer 411B may be disposed to be in contact with the adjacent colour conversion layers 410G and 410R. FIG. 4 shows a case where the first colour filter layer 411B is disposed to be in contact with the second colour conversion layer 410G of the adjacent colour conversion layers 410G and 410R. However, the present disclosure is not limited thereto, and the first colour filter layer 411B may be disposed to be in contact with the third colour conversion layer 410R which is an adjacent colour conversion layer located on the opposite side of the second colour conversion layer 410G.

[0067] FIGS. 5 and 6 are sectional views of colour conversion elements 12 and 13 of the present disclosure. Each of the colour conversion elements 12 and 13 of FIGS. 5 and 6 is the same as the colour conversion element 10 of FIGS. 1 and 2, except that a part of each of the first colour filter layers 412B and 413B is disposed on the adjacent colour conversion layer 410G to overlap at least a part of the colour conversion layer 410G. Hereinafter, differences from the above examples will be mainly described.

[0068] Referring to FIGS. 5 and 6, a part of each of the first colour filter layers 412B and 413B is disposed on the adjacent colour conversion layer 410G to overlap at least a part of the colour conversion layer 410G. FIGS. 5 and 6 shows a case where each of the first colour filter layers 412B and 413B overlaps the second colour conversion layer 410G of the adjacent colour conversion layers 410G and 410R. However, the present disclosure is not limited thereto, and each of the first colour filter layers 412B and 413B may be disposed on the third colour conversion layer 410R to overlap the third colour conversion layer 410R which is an adjacent colour conversion layer located on the opposite side of the second colour conversion layer 410G.

[0069] FIG. 5 shows a case where the first colour filter layer 412B is disposed in an overall higher shape than the second colour conversion layer 410G. For example, the first colour filter layer 412B may have a larger thickness than the second colour conversion layer 410G, and may partially overlap a top surface of the second colour conversion layer 410G.

[0070] FIG. 6 shows a case where only the portion of the first colour filter layer 413B disposed on the second colour conversion layer 410G is disposed to protrude upwards. For example, the first colour filter layer 413B may have a first top surface level with that of the second colour conversion layer 410G, and a second top surface partially overlapping the top surface of the second colour conversion layer 410G.

[0071] The light emitted from the display element 20 may be applied toward each of the colour conversion elements 12 and 13 from above of FIGS. 5 and 6 (refer to FIG. 3), and a part of the light may be incident on a region where each of the first colour filter layers 412B and 413B overlaps the second colour conversion layer 410G. However, since the light having passed through each of the first colour filter layers 412B and 413B in the region is finally converted into the second colour light while passing through the second colour conversion layer 410G, the realization of a desired colour of each of the colour conversion elements 12 and 13 is not influenced.

[0072] FIGS. 7 and 8 are sectional views of colour conversion elements 14 and 15 not claimed. Each of the colour conversion elements 14 and 15 of FIGS. 7 and 8 is the same as the colour conversion element 10 of FIGS. 1 and 2, except that each of the first colour filter layers 414B and 415B includes a plurality of sub-filter layers. Hereinafter, differences from the above examples will be mainly described.

[0073] Referring to FIG. 7, the first colour filter layer 414B may include sub-filter layers 414Ba and 414Bb disposed on both sides of the first colour region Rb or on the rim of the first colour region Rb. Further, the first colour filter layer 415B may include a plurality of sub-filter layers arranged in a slit shape as shown in FIG. 8. As described above, in a region where the sub-filter layers are not arranged, light can pass through each of the colour conversion elements 14 and 15 without loss of luminance, and in a region where the sub-filter layers are arranged, the viewing angle and/or colour purity of light can be improved. The balance between luminance and viewing angle/colour purity can be set to a desired level by adjusting the shape, size and number of the sub-filter layers.

[0074] FIG. 9 is a sectional view of a colour conversion element 16 not claimed. The colour conversion element 16 of FIG. 9 is the same as the colour conversion element 10 of FIGS. 1 and 2, except that the first colour filter layer 416B is disposed in the first colour region Rb in an island shape. Hereinafter, differences from the above examples will be mainly described.

[0075] Referring to FIG. 9, the first colour filter layer 416B may be disposed in the first colour region Rb in an island shape. In this case, the first colour filter layer 416B may be disposed to be spaced apart from the light blocking member BM without being in contact with the light blocking member BM. In this case, a part of the light incident on the first colour region Rb may pass through the first colour filter layer 416B, and the remaining light may transmit the portion where the first colour filter layer 416B is not disposed.

[0076] FIG. 10 is a sectional view of a colour conversion element 17 not claimed. The colour conversion element 17 of FIG. 10 is the same as the colour conversion element 10 of FIGS. 1 and 2, except that the scattering agent S and/or the colourant P is contained only in a part of the first colour filter layer 417B. Hereinafter, differences from the above examples will be mainly described.

[0077] Referring to FIG. 10, the first colour filter layer 417B may be formed of a transparent organic film, and may include a first portion 417Ba in which the scattering agent S and/or the colourant P is dispersed, and a second portion 417Bb which does not contain the scattering agent S and the colourant P. The first portion 417Ba and the second portion 417Bb may have a horizontal positional relationship with respect to each other with reference to FIG. 10.

[0078] The first colour filter layer is therefore arranged to filter light incident on the first portion 417Ba, but not arranged to filter light incident on the second portion 417Bb. Hence, the light incident on the first portion 417Ba of the first colour filter layer 417B can be improved in viewing angle/colour purity as described above, and the light incident on the second portion 417Bb of the first colour filter layer 417B can be maintained in luminance because it passes through only the transparent organic film. In this case, the first colour filter layer 417B may be disposed over the entire first colour region Rb, but the present invention is not limited thereto.

[0079] FIG. 11 is a sectional view of a colour conversion element 18 not claimed. The colour conversion element 18 of FIG. 11 is the same as the colour conversion element 10 of FIGS. 1 and 2, except that an opening O is defined in a portion of the first colour region Rb where the first colour filter layer 410B is not disposed. Hereinafter, differences from the above examples will be mainly described.

[0080] Referring to FIG. 11, a portion in which the protective layer 501 is not disposed, that is, an opening O of the protective layer 501, may be defined in the portion of the first colour region Rb where the first colour filter layer 410B is not disposed. Therefore, the light incident on the portion of the first colour region Rb where the first colour filter layer 410B is not disposed may not pass through the protective layer, so that the loss of luminance can be further reduced.

[0081] FIG. 12 is a sectional view of a display device not claimed. The display device of FIG. 12 is the same as the display device of FIG. 3, except that a colour conversion element 19 is directly disposed on a display element 21. Hereinafter, differences from the above examples will be mainly described.

[0082] Referring to FIG. 12, unlike the display device of FIG. 3 in which the colour conversion element 10 is disposed on the display element 20 as a separate substrate, the colour conversion element 19 is directly disposed on a planarization film 260 covering the display element 21. However, the present invention is not limited thereto, and the upper surface of the capping layer 250 may be formed flat without a separate planarization layer 260, so that the colour conversion element 19 may be directly formed on the capping layer 250.

[0083] The light blocking member BM and filter layer and colour conversion layers 610B, 610G, and 610R of the colour conversion element 19 may be disposed on the upper surface of the planarization film 260 (or capping layer 250) of the display element 21 using the upper surface thereof as a base surface. In this case, the light emitted from the display element 21 may be incident from the lower portion of the colour conversion element 19 with reference to FIG. 12. Therefore, each of the second and third colour conversion layers 610G and 610R may have a structure in which the cutting layer 620G or 620R is laminated on a second or third colour conversion medium layer 630G or 630R.

[0084] A sealing substrate 800 may be further disposed on the protective layer 700 of the colour conversion element 19. The sealing substrate 800 may be a light transmitting substrate. However, the sealing substrate 800 may be omitted in some cases.

[0085] FIGS. 13 and 14 are sectional views of colour conversion elements 19_1 and 19_2 of the present disclosure. The colour conversion element 19_1 of FIG. 13 is the same as the colour conversion element 19 of FIG. 19, except that a part of a colour conversion layer 611G adjacent to the first colour filter layer 611B is disposed on the first colour filter layer 611B so as to overlap at least a part of the first colour conversion layer 611B. Hereinafter, differences from the above examples will be mainly described.

[0086] Referring to FIGS. 13 and 14, a part of each of the colour conversion layers 611G and 612G adjacent to the first colour filter layer 611B is disposed on the first colour filter layer 611B so as to overlap at least a part of the first colour filter layer 611B. Specifically, each of the colour conversion medium layers 631G and 632G in the colour conversion layers 611G and 612G is disposed on the first colour filter layer 611B. FIGS. 13 and 14 show a case where a part of each of the second colour conversion layers 611G and 612G in adjacent colour conversion layers overlaps the first colour filter layer 611B. However, the present disclosure is not limited thereto, and a part of the third colour conversion layer 610R which is an adjacent colour conversion layer located at the opposite side of each of the second colour conversion layers 611G and 612G may be disposed to overlap the first colour filter layer 611B.

[0087] FIG. 13 shows a case where the second colour conversion layer 611G is disposed in an overall higher shape than the first colour filter layer 611B, and FIG. 14 shows a case where only the portion of the second colour conversion layer 612G disposed on the first colour filter layer 611B is disposed to protrude upwards.

[0088] The light emitted from the display element 21 may be applied toward the colour conversion element 19 from below of FIGS. 13 and 14 (refer to FIG. 12), and a part of the light may be incident on a region where the first colour filter layer 611B overlaps each of the second colour conversion layer 611G and 612G. However, since the light having passed through the first colour filter layer 611B in the region is finally converted into the second colour light while passing through each of the second colour conversion layer 611G and 612G, particularly each of the second colour conversion medium layers 631G and 632G, the realization of a desired colour of the colour conversion element19 is not influenced.

[0089] By way of summation and review, when blue light is transmitted as it is through a colour conversion element, a viewing angle (white angular dependency, WAD) for blue light may be reduced. Further, when the purity of the blue light itself emitted from the light source is low, the colour purity of the blue colour viewed through the colour conversion element may also be lowered. However, when a scattering agent or a separate blue filter is provided in a region expressing the blue colour in the colour conversion element in order to improve the viewing angle or colour purity of the blue light, luminance of the light emitted through the scattering agent or the colour filter may be lowered.

[0090] In contrast, a colour conversion element is provided, which can set a balance between luminance and a viewing angle or colour purity for a specific colour to a desired level, and a display device including the same. That is, as described above, a region of a colour conversion element expressing a specific, e.g., blue, colour is provided with only as many filter layers as necessary, thereby setting a balance between luminance and a viewing angle or colour purity for a specific colour to a desired level. The effects of the present invention are not limited by the foregoing, and other various effects are anticipated herein.

[0091] Examples have been disclosed herein, and although specific terms are employed, they are used and are to be interpreted in a generic and descriptive sense only and not for purpose of limitation. In some instances, as would be apparent to one of ordinary skill in the art as of the filing of the present application, features, characteristics, and/or elements described in connection with a particular example may be used singly or in combination with features, characteristics, and/or elements described in connection with other examples unless otherwise specifically indicated. Accordingly, it will be understood by those of skill in the art that various changes in form and details may be made without departing from scope of the present invention as set forth in the following claims.

Claims

1. A colour conversion element (10), comprising:

   a plurality of light transmitting regions including a first colour region (Rb), a second colour region (Rg), and a third colour region (Rr), which are spaced apart from each other; and
   a first colour filter layer (410B) located at least partially in the first colour region (Rb);
   wherein the first colour region (Rb) includes a first region and a second region, the first region being a region where the first colour filter layer (410B) is arranged to filter light, and the second region being a region where the first colour filter layer (410B) is not arranged to filter light,
   wherein the second region of the first colour region (Rb) does not include the first colour filter layer (410B) at all,
   wherein the colour conversion element (10) further comprises a second colour conversion layer (410G) located in the second colour region (Rg) and a third colour conversion layer (410R) located in the third colour region (Rr),
   and wherein the colour conversion element (10) further comprises a base substrate (300);
   wherein the second colour conversion layer (410G) is located in in the second colour region (Rg) and the third colour conversion layer (410R) is located in the third colour region (Rr);
   the first colour filter layer (410B), the second colour conversion layer (410G) and the third colour conversion layer (410R) are disposed on the base substrate (300);
   the first colour filter layer (410B), the second colour conversion layer (410G), and the third colour conversion layer (410R) are sequentially arranged on a plane; and
   an interval between the first colour filter layer (410B) and the second colour conversion layer (410G) is different from an interval between the second colour conversion layer (410G) and the third colour conversion layer (410R), wherein the second colour conversion layer (410G) and/or the third colour conversion layer (410R) includes:

      a first colour cutting layer (420G, 420R); and
      a colour conversion medium layer (430G, 430R) overlapping the first colour cutting layer (420G, 420R), wherein a part of the colour conversion medium layer (430G, 430R) is on the first colour filter layer (410B) to overlap at least a part of the first colour filter layer (410B).

2. A colour conversion element (10) as claimed in claim 1, wherein the colour conversion medium layer (420G, 420R) contains a quantum dot (QD).

3. A colour conversion element (10) as claimed in claim 1 or claim 2, wherein the first colour filter layer (410B), the second colour conversion layer (410G), and the third colour conversion layer (410R) correspond to regions emitting first, second, and third colours, respectively, the first, second, and third colours being blue, green, and red colours, respectively.

4. A colour conversion element (10) as claimed in any preceding claim, wherein the first colour filter layer (410B) contains a scattering agent (S).

5. A colour conversion element (10) as claimed in any preceding claim, wherein the first colour filter layer (410B) contains at least one of a pigment having a first colour and a dye having the first colour.

6. A colour conversion element (10) as claimed in any one of claims 1 to 5, wherein an area of the first colour filter layer (410B) overlapping the base substrate (300) is different from an area of the second colour conversion layer (410G) or the third colour conversion layer (410R) overlapping the base substrate (300).

7. A colour conversion element (10) as claimed in any one of claims 1 to 6, wherein an area of the first colour filter layer (410B) contacting the base substrate (300) is different from an area of the second colour conversion layer (410G) or the third colour conversion layer (410R) contacting the base substrate (300).

8. A colour conversion element (10) as claimed in any preceding claim, further comprising a light blocking member (BM) located among the first colour filter region, the second colour conversion region, and the

third colour conversion region.

9. A display device, comprising:

a light emitting element (200) in which a plurality of pixels are defined; and
a colour conversion element (10) according to any preceding claim;
wherein the first, second and third colour regions (Rb, Rg, Rr) respectively correspond in position to first, second and third ones of the pixels; and the light emitting element (200) and the colour conversion element (10) are arranged such that light from the said first one of the pixels can pass through the said first region (Rb).

10. A display device as claimed in claim 9, wherein the light emitting element (200) emits blue light.

Patentansprüche

1. Farbumwandlungselement (10), das Folgendes umfasst:

eine Vielzahl von lichtdurchlässigen Regionen einschließlich einer ersten Farbregion (Rb), einer zweiten Farbregion (Rg) und einer dritten Farbregion (Rr), die voneinander beabstandet sind; und
eine erste Farbfilterschicht (410B), die sich mindestens teilweise in der ersten Farbregion (Rb) befindet;
wobei die erste Farbregion (Rb) eine erste Region und eine zweite Region einschließt, wobei die erste Region eine Region ist, in der die erste Farbfilterschicht (410B) zum Filtern von Licht angeordnet ist, und die zweite Region eine Region ist, in der die erste Farbfilterschicht (410B) nicht zum Filtern von Licht angeordnet ist,
wobei die zweite Region der ersten Farbregion (Rb) die erste Farbfilterschicht (410B) überhaupt nicht einschließt,
wobei das Farbumwandlungselement (10) ferner eine in der zweiten Farbregion (Rg) befindliche zweite Farbumwandlungsschicht (410G) und eine in der dritten Farbregion (Rr) befindliche dritte Farbumwandlungsschicht (410R) umfasst;
und wobei das Farbumwandlungselement (10) ferner ein Basissubstrat (300) umfasst;
wobei sich die zweite Farbumwandlungsschicht (410G) in in der zweiten Farbregion (Rg) befindet und sich die dritte Farbumwandlungsschicht (410R) in der dritten Farbregion (Rr) befindet;
die erste Farbfilterschicht (410B), die zweite Farbumwandlungsschicht (410G) und die dritte Farbumwandlungsschicht (410R) auf dem Basissubstrat (300) angeordnet sind;
die erste Farbfilterschicht (410B), die zweite Farbumwandlungsschicht (410G) und die dritte Farbumwandlungsschicht (410R) sequentiell auf einer Ebene angeordnet sind; und
sich ein Abstand zwischen der ersten Farbfilterschicht (410B) und der zweiten Farbumwandlungsschicht (410G) von einem Abstand zwischen der zweiten Farbumwandlungsschicht (410G) und der dritten Farbumwandlungsschicht (410R) unterscheidet, wobei die zweite Farbumwandlungsschicht (410G) und/oder die dritte Farbumwandlungsschicht (410R) Folgendes einschließt:

eine erste Farbschneideschicht (420G, 420R); und
eine Farbumwandlungsmediumschicht (430G, 430R), die die erste Farbschneideschicht (420G, 420R) überlappt, wobei ein Teil der Farbumwandlungsmediumschicht (430G, 430R) auf der ersten Farbfilterschicht (410B) liegt, um mindestens einen Teil der ersten Farbfilterschicht (410B) zu überlappen.

2. Farbumwandlungselement (10) nach Anspruch 1, wobei die Farbumwandlungsmediumschicht (420G, 420R) einen Quantenpunkt (QD) enthält.

3. Farbumwandlungselement (10) nach Anspruch 1 oder Anspruch 2, wobei die erste Farbfilterschicht (410B), die zweite Farbumwandlungsschicht (410G) und die dritte Farbumwandlungsschicht (410R) Regionen entsprechen, die jeweils eine erste, zweite und dritte Farbe emittieren, wobei die erste, zweite und dritte Farbe jeweils eine blaue, grüne und rote Farbe sind.

4. Farbumwandlungselement (10) nach einem vorhergehenden Anspruch, wobei die erste Farbfilterschicht (410B) ein Streumittel (S) enthält.

5. Farbumwandlungselement (10) nach einem vorhergehenden Anspruch, wobei die erste Farbfilterschicht (410B) mindestens eines von einem Pigment mit einer ersten Farbe und einem Farbstoff mit der ersten Farbe enthält.

6. Farbumwandlungselement (10) nach einem der Ansprüche 1 bis 5, wobei sich ein Bereich der das Basissubstrat (300) überlappenden ersten Farbfilterschicht (410B) von einem Bereich der zweiten Farbumwandlungsschicht (410G) oder der dritten Farbumwandlungsschicht (410R), die das Basissubstrat (300) überlappt, unterscheidet.

7. Farbumwandlungselement (10) nach einem der Ansprüche 1 bis 6, wobei sich ein Bereich der ersten Farbfilterschicht (410B), der in Kontakt mit dem Basissubstrat (300) steht, von einem Bereich der zweiten Farbumwandlungsschicht (410G) oder der dritten Farbumwandlungsschicht (410R), der in Kontakt mit dem Basissubstrat (300) steht, unterscheidet.

8. Farbumwandlungselement (10) nach einem vorhergehenden Anspruch, das ferner ein lichtblockierendes Element (BM) umfasst, das sich zwischen der ersten Farbfilterregion, der zweiten Farbumwandlungsregion und der dritten Farbumwandlungsregion befindet.

9. Anzeigevorrichtung, die Folgendes umfasst:

ein lichtemittierendes Element (200), in dem eine Vielzahl von Pixeln definiert sind; und
ein Farbumwandlungselement (10) nach einem vorhergehenden Anspruch;
wobei die erste, zweite und dritte Farbregion (Rb, Rg, Rr) jeweils in ihrer Position dem ersten, zweiten und dritten der Pixel entsprechen; und
das lichtemittierende Element (200) und das Farbumwandlungselement (10) so angeordnet sind, dass Licht von dem ersten der Pixel durch die erste Region (Rb) passieren kann.

10. Anzeigevorrichtung nach Anspruch 9, wobei das lichtemittierende Element (200) blaues Licht emittiert.

Revendications

1. Élément de conversion de couleur (10), comprenant :

une pluralité de régions de transmission de la lumière incluant une première région de couleur (Rb), une deuxième région de couleur (Rg) et une troisième région de couleur (Rr), qui sont espacées les unes des autres ; et
une première couche de filtre de couleur (410B) située au moins partiellement dans la première région de couleur (Rb) ;
dans lequel la première région de couleur (Rb) inclut une première région et une deuxième région, la première région étant une région où la première couche de filtre de couleur (410B) est agencée pour filtrer la lumière, et la deuxième région étant une région où la première couche de filtre de couleur (410B) n'est pas agencée pour filtrer la lumière,
dans lequel la deuxième région de la première région de couleur (Rb) n'inclut pas du tout la première couche de filtre de couleur (410B),
dans lequel l'élément de conversion de couleur (10) comprend en outre une deuxième couche de conversion de couleur (410G) située dans la deuxième région de couleur (Rg) et une troisième couche de conversion de couleur (410R) située dans la troisième région de couleur (Rr),
et dans lequel l'élément de conversion de couleur (10) comprend en outre un substrat de base (300) ;
dans lequel la deuxième couche de conversion de couleur (410G) est située dans dans la deuxième région de couleur (Rg) et la troisième couche de conversion de couleur (410R) est située dans la troisième région de couleur (Rr) ;
la première couche de filtre de couleur (410B), la deuxième couche de conversion de couleur (410G) et la troisième couche de conversion de couleur (410R) sont disposées sur le substrat de base (300) ;
la première couche de filtre de couleur (410B), la deuxième couche de conversion de couleur (410G) et la troisième couche de conversion de couleur (410R) sont disposées séquentiellement sur un plan ; et
un intervalle entre la première couche de filtre de couleur (410B) et la deuxième couche de conversion de couleur (410G) est différent d'un intervalle entre la deuxième couche de conversion de couleur (410G) et la troisième couche de conversion de couleur (410R), dans lequel la deuxième couche de conversion de couleur (410G) et/ou la troisième couche de conversion de couleur (410R) inclut :

une première couche de découpe de couleur (420G, 420R) ; et
une couche de milieu de conversion de couleur (430G, 430R) chevauchant la première couche de découpe de couleur (420G, 420R), dans lequel une partie de la couche de milieu de conversion de couleur (430G, 430R) se trouve sur la première couche de filtre de couleur (410B) pour chevaucher au moins une partie de la première couche de filtre de couleur (410B).

2. Élément de conversion de couleur (10) selon la revendication 1, dans lequel la couche de milieu de conversion de couleur (420G, 420R) contient un point quantique (QD).

3. Élément de conversion de couleur (10) selon la revendication 1 ou la revendication 2, dans lequel la première couche de filtre de couleur (410B), la deuxième couche de conversion de couleur (410G) et la troisième couche de conversion de couleur (410R) correspondent à des régions émettant respectivement une première, une deuxième et une troisième couleur, la première, la deuxième et la troisième couleur étant respectivement une couleur bleue, une couleur verte et une couleur rouge.

4. Élément de conversion de couleur (10) selon l'une quelconque des revendications précédentes, dans lequel la première couche de filtre de couleur (410B) contient un agent de diffusion (S).

5. Élément de conversion de couleur (10) selon l'une quelconque des revendications précédentes, dans lequel la première couche de filtre de couleur (410B) contient au moins un d'un pigment ayant une première couleur et d'un colorant ayant la première couleur.

6. Élément de conversion de couleur (10) selon l'une quelconque des revendications 1 à 5, dans lequel une zone de la première couche de filtre de couleur (410B) chevauchant le substrat de base (300) est différente d'une zone de la deuxième couche de conversion de couleur (410G) ou de la troisième couche de conversion de couleur (410R) chevauchant le substrat de base (300).

7. Élément de conversion de couleur (10) selon l'une quelconque des revendications 1 à 6, dans lequel une zone de la première couche de filtre de couleur (410B) en contact avec le substrat de base (300) est différente d'une zone de la deuxième couche de conversion de couleur (410G) ou de la troisième couche de conversion de couleur (410R) en contact avec le substrat de base (300).

8. Élément de conversion de couleur (10) selon l'une quelconque des revendications précédentes, comprenant en outre un élément de blocage de la lumière (BM) situé entre la première région de filtre de couleur, la deuxième région de conversion de couleur et la troisième région de conversion de couleur.

9. Dispositif d'affichage, comprenant :

un élément émetteur de lumière (200) dans lequel une pluralité de pixels sont définis ; et
un élément de conversion de couleur (10) selon l'une quelconque des revendications précédentes ;
dans lequel la première, la deuxième et la troisième région de couleur (Rb, Rg, Rr) correspondent respectivement en leur position au premier, deuxième et troisième des pixel ; et
l'élément émetteur de lumière (200) et l'élément de conversion de couleur (10) sont disposés de sorte que ladite lumière provenant dudit premier des pixels peut traverser ladite première région (Rb).

10. Dispositif d'affichage selon la revendication 9, dans lequel l'élément émetteur de lumière (200) émet de la lumière bleue.

FIG. 1

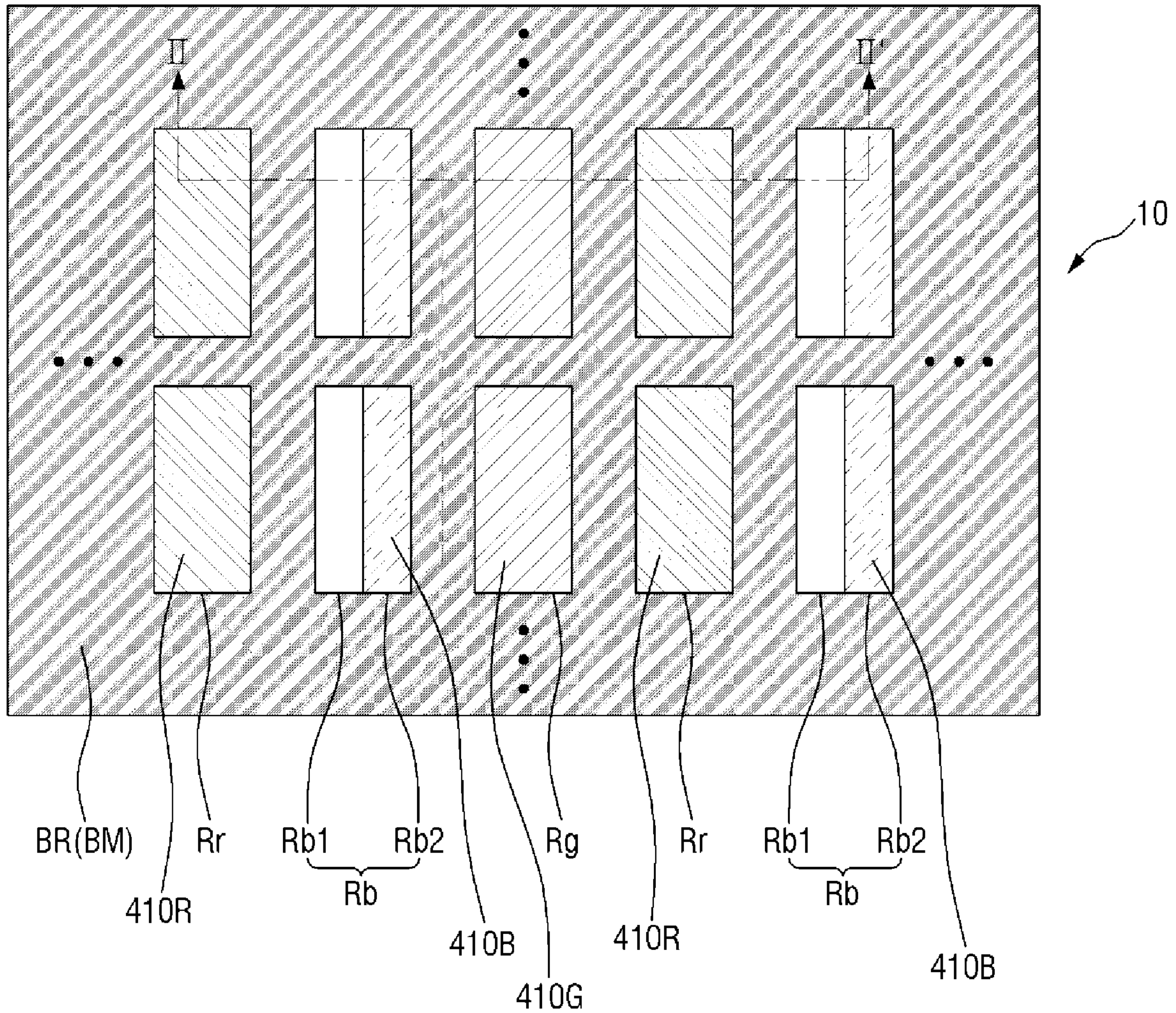

II
II'
10
BR(BM)
Rr
Rb1
Rb2
Rb
410R
410B
Rg
410G
Rr
410R
Rb1
Rb2
Rb
410B

FIG. 2

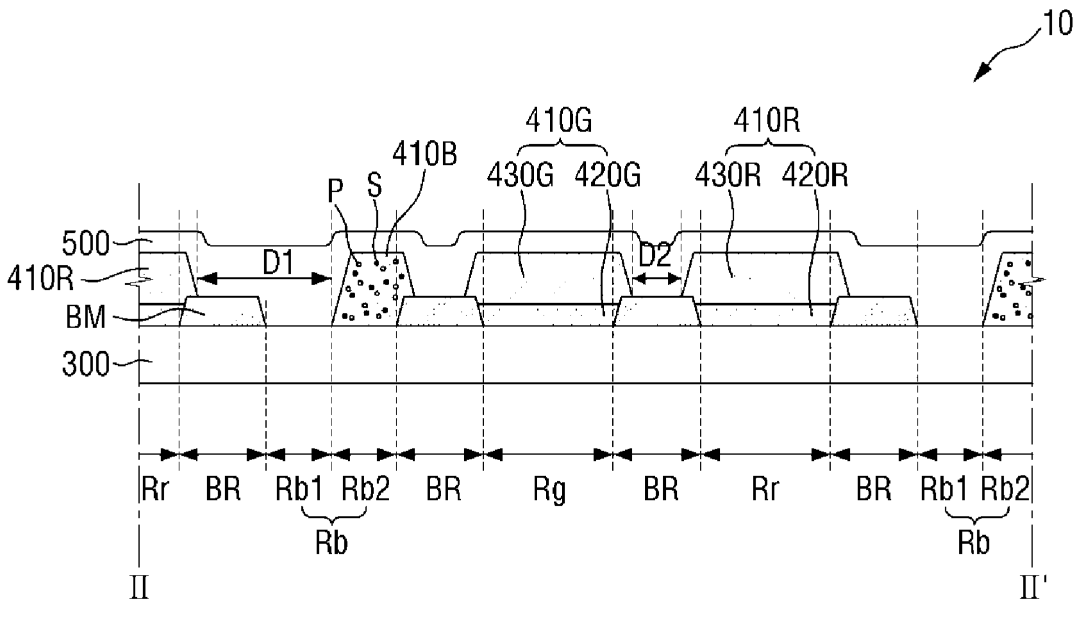
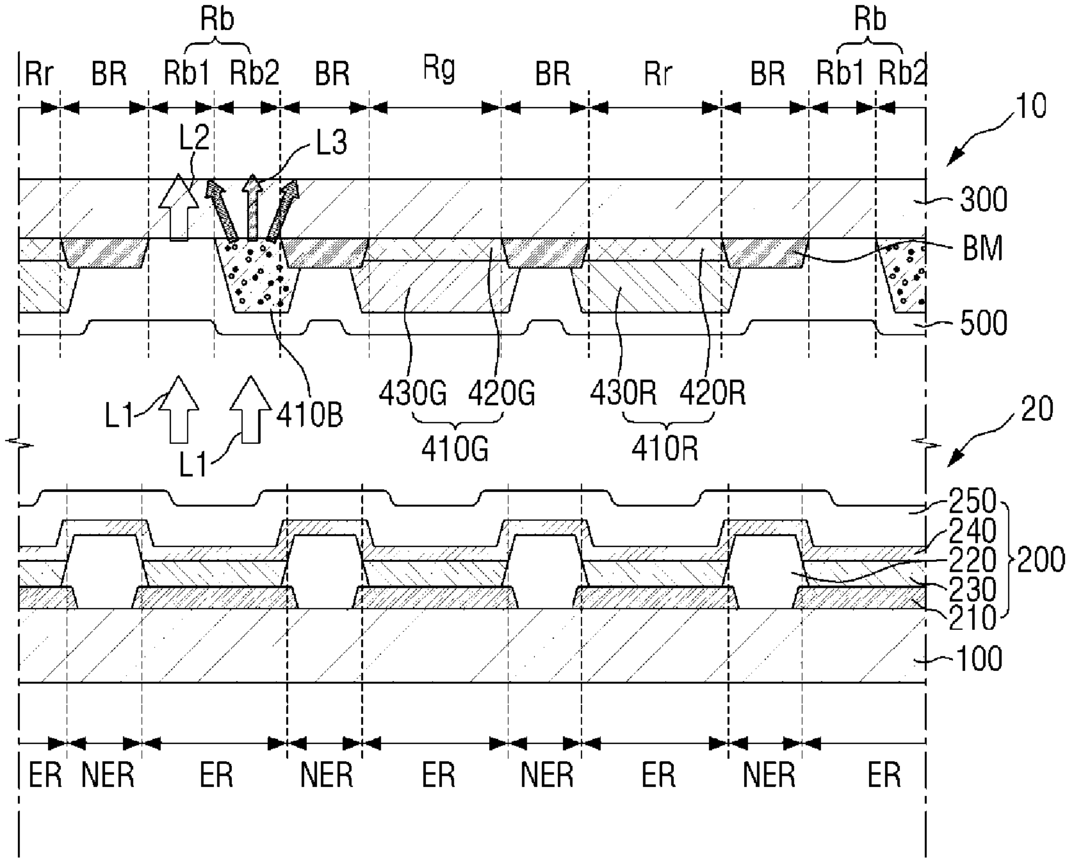

10
410G
410R
410B
P
S
430G
420G
430R
420R
500
410R
D1
D2
BM
300
Rr
BR
Rb1
Rb2
BR
Rg
BR
Rr
BR
Rb1
Rb2
Rb
Rb
II
II'

FIG. 3



Rb
Rr
BR
Rb1
Rb2
BR
Rg
BR
Rr
BR
Rb1
Rb2
Rb
10
L2
L3
300
BM
500
L1
L1
410B
430G
420G
410G
430R
420R
410R
20
250
240
220
230
210
200
100
ER
NER
ER
NER
ER
NER
ER
NER
ER

FIG. 4

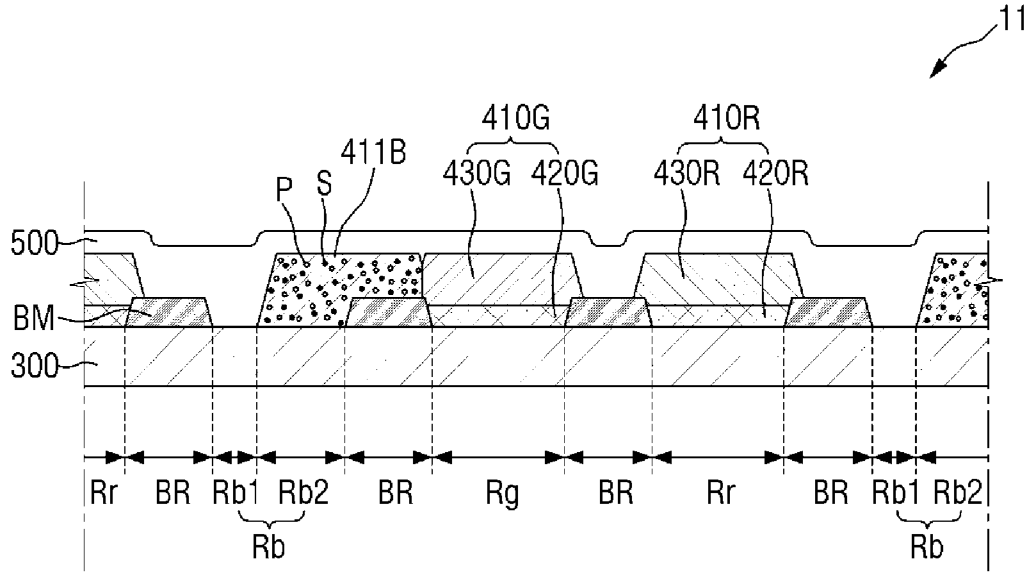

11
410G
410R
411B
P
S
430G
420G
430R
420R
500
BM
300
Rr
BR
Rb1
Rb2
BR
Rg
BR
Rr
BR
Rb1
Rb2
Rb
Rb

FIG. 5

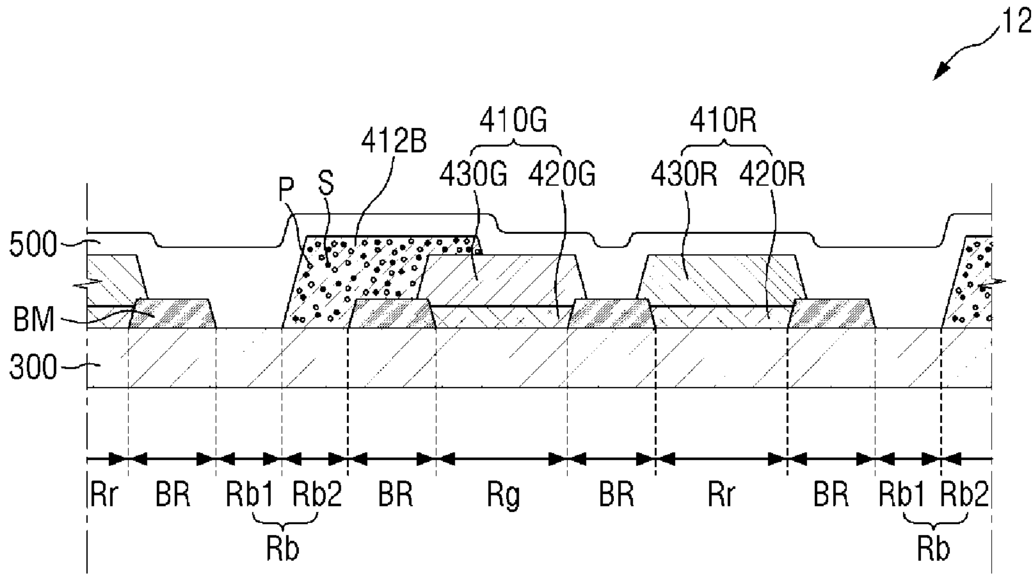

12
410G
410R
412B
P
S
430G
420G
430R
420R
500
BM
300
Rr
BR
Rb1
Rb2
BR
Rg
BR
Rr
BR
Rb1
Rb2
Rb
Rb

FIG. 6

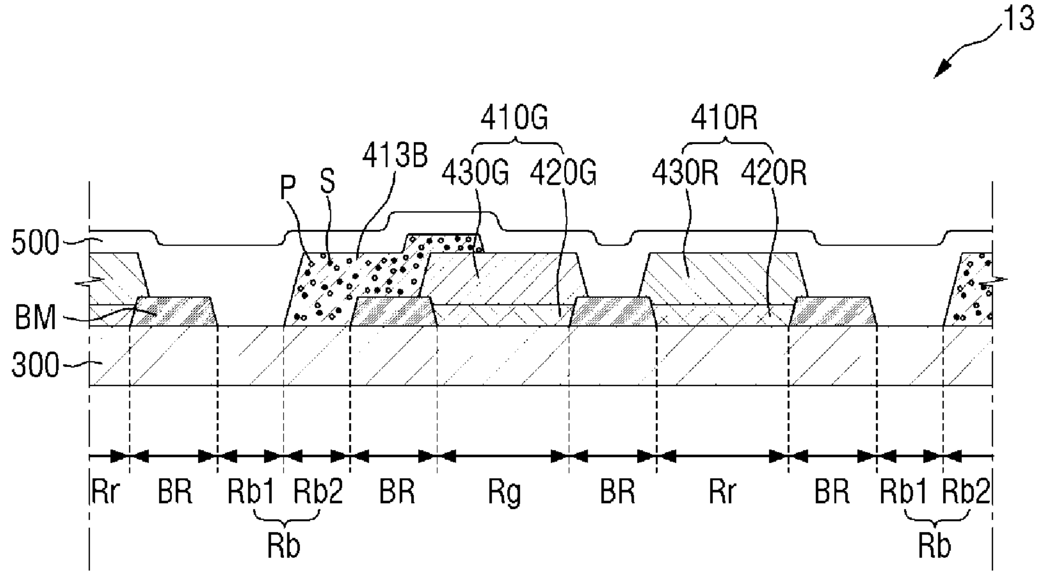

13
410G
410R
413B
P
S
430G
420G
430R
420R
500
BM
300
Rr
BR
Rb1
Rb2
BR
Rg
BR
Rr
BR
Rb1
Rb2
Rb
Rb

FIG. 7

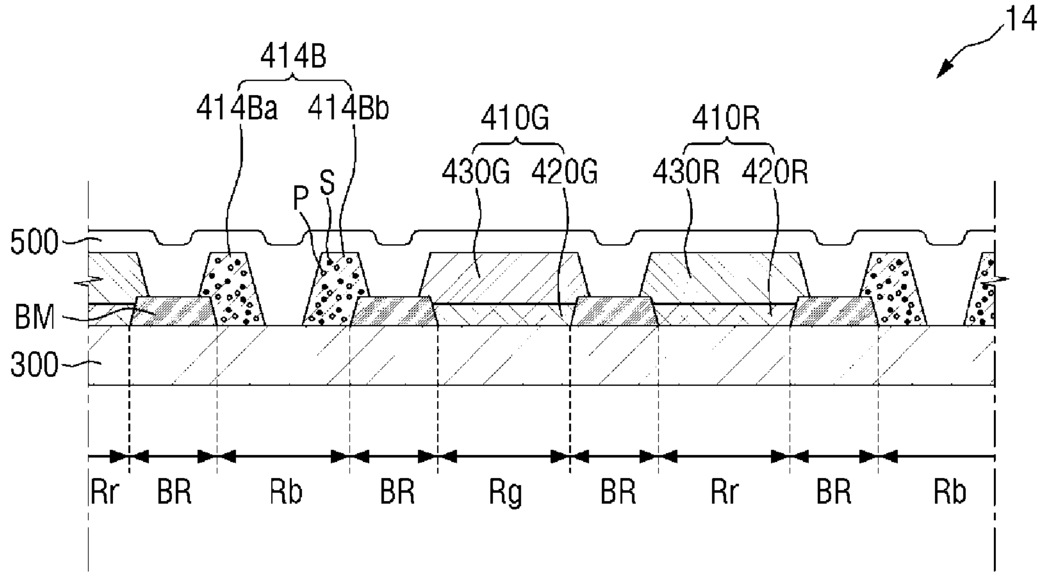

14
414B
414Ba
414Bb
410G
410R
P
S
430G
420G
430R
420R
500
BM
300
Rr
BR
Rb
BR
Rg
BR
Rr
BR
Rb

FIG. 8

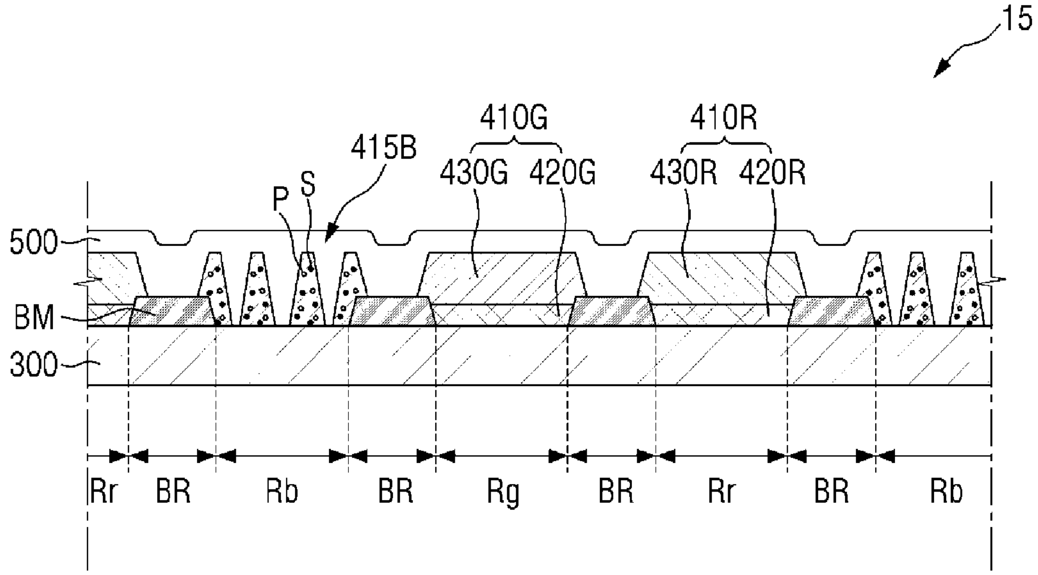

15
410G
410R
415B
430G
420G
430R
420R
P
S
500
BM
300
Rr
BR
Rb
BR
Rg
BR
Rr
BR
Rb

FIG. 9

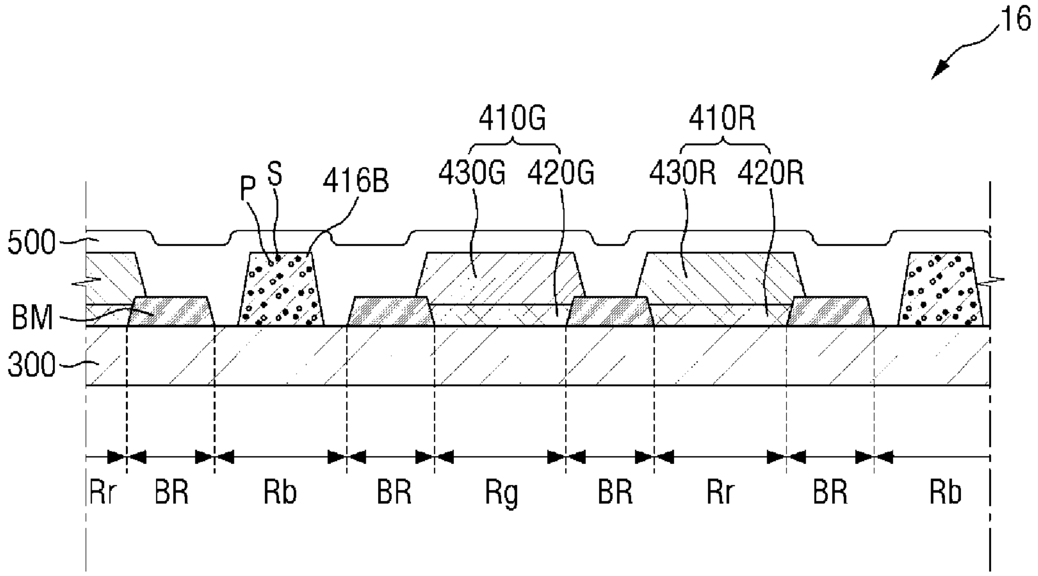

16
410G
410R
P
S
416B
430G
420G
430R
420R
500
BM
300
Rr
BR
Rb
BR
Rg
BR
Rr
BR
Rb

FIG. 10

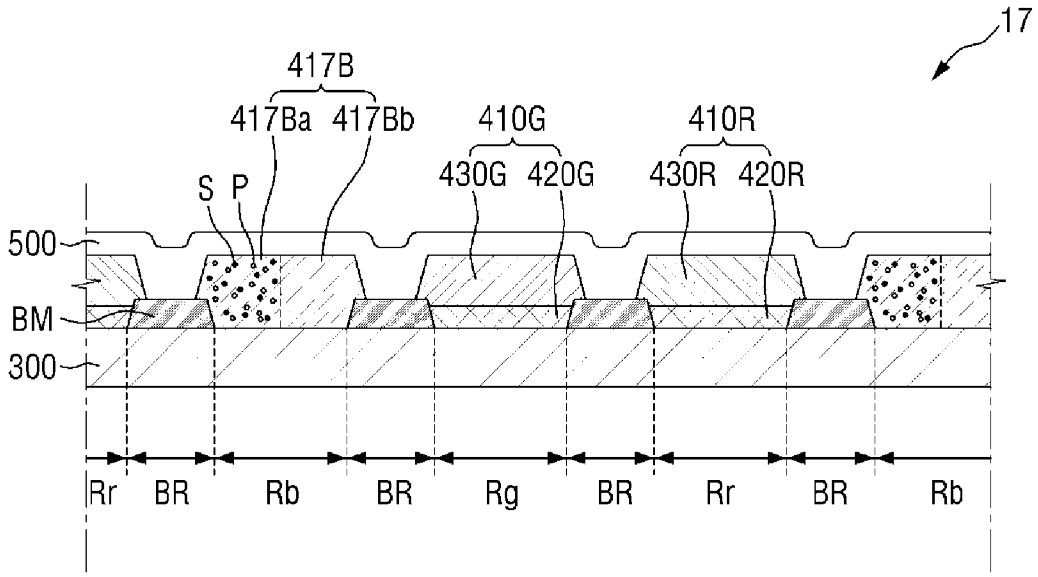

17
417B
417Ba
417Bb
410G
410R
430G
420G
430R
420R
S
P
500
BM
300
Rr
BR
Rb
BR
Rg
BR
Rr
BR
Rb

FIG. 11

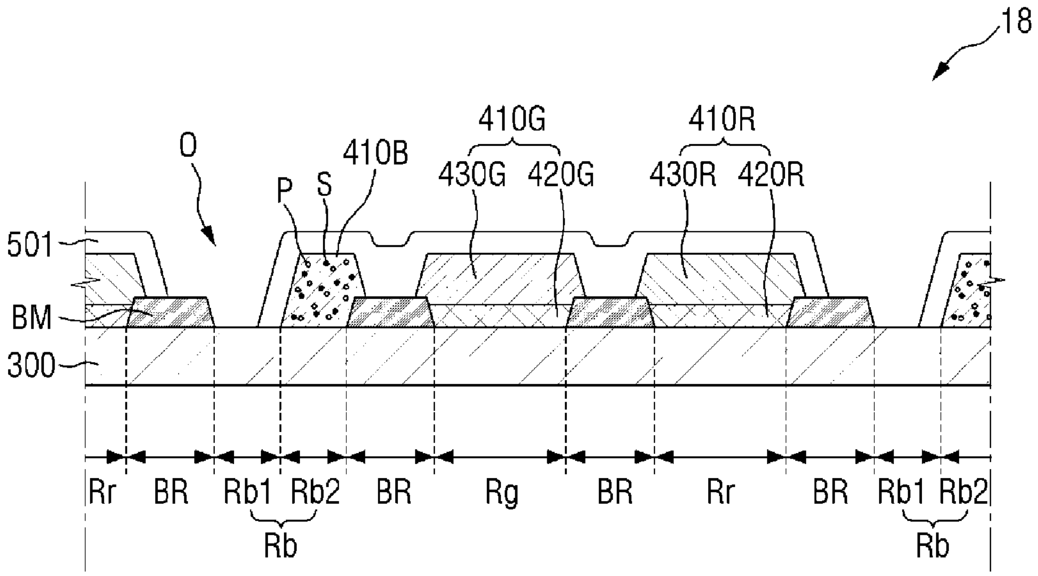

18
410G
410R
O
410B
430G
420G
430R
420R
P
S
501
BM
300
Rr
BR
Rb1
Rb2
BR
Rg
BR
Rr
BR
Rb1
Rb2
Rb
Rb

FIG. 12

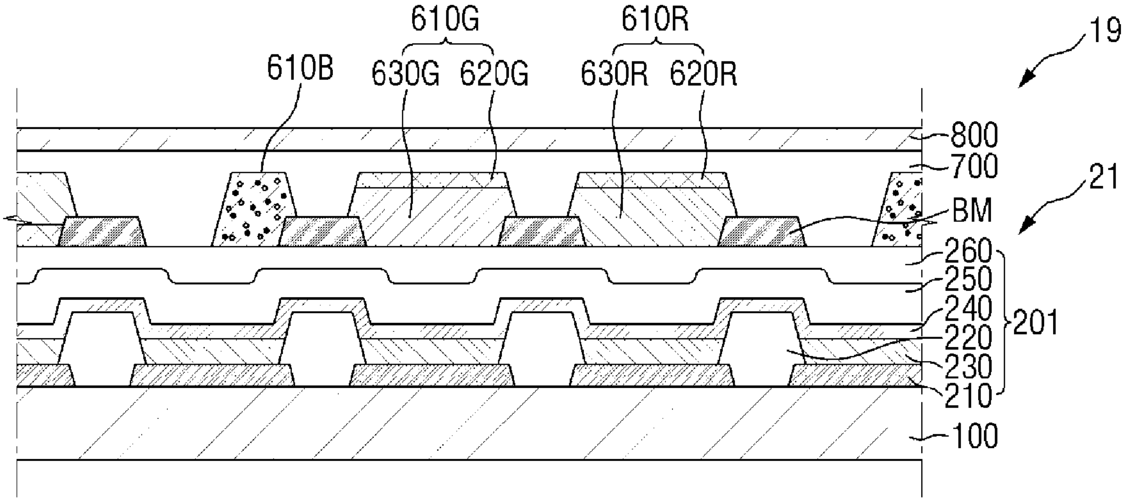

610G
610R
19
610B
630G
620G
630R
620R
800
700
21
BM
260
250
240
220
201
230
210
100

FIG. 13

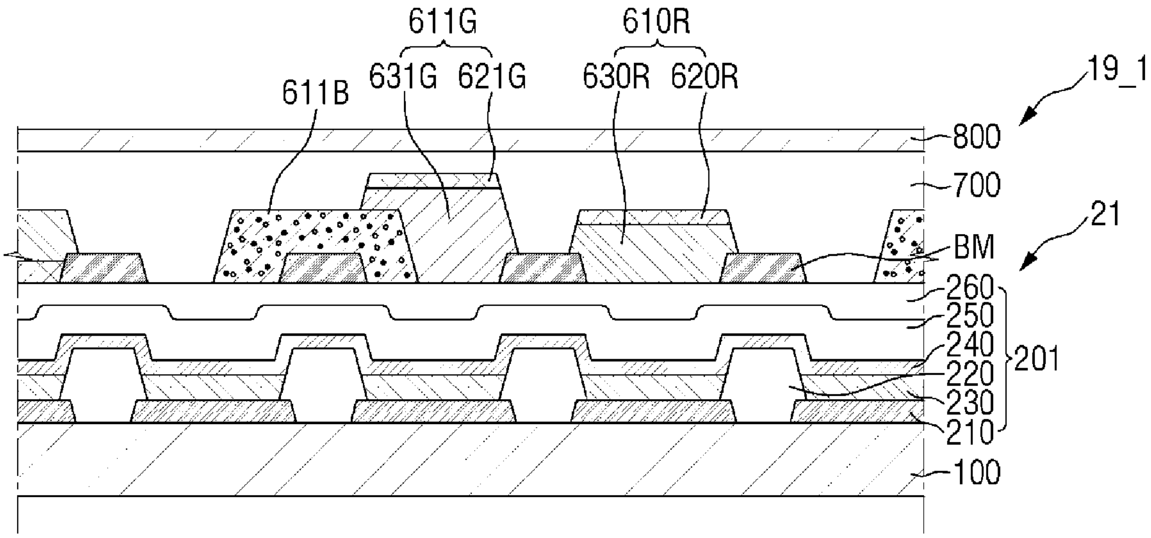
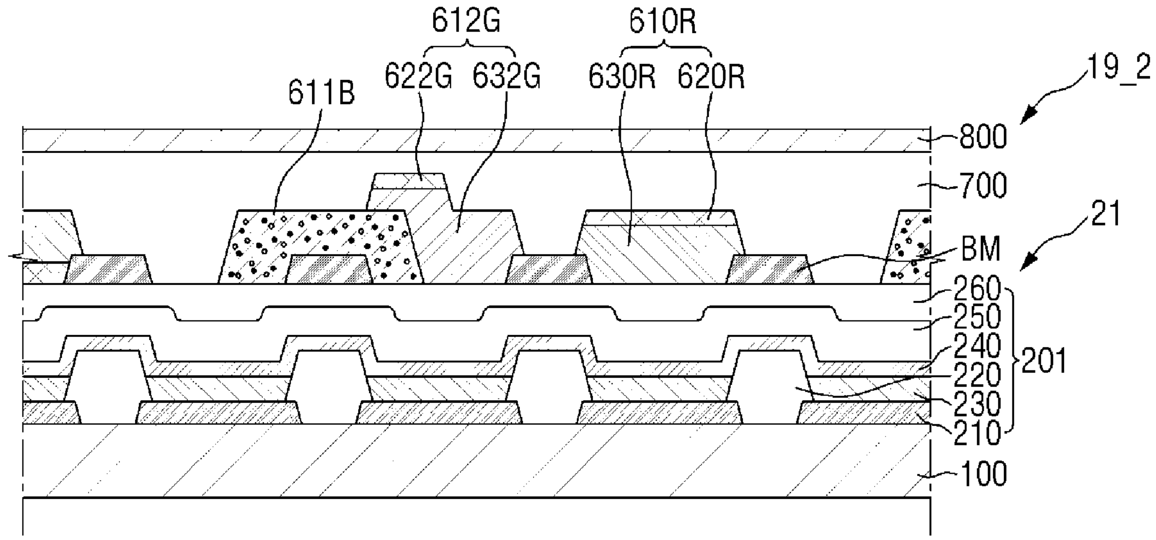

611G
610R
19_1
611B
631G
621G
630R
620R
800
700
21
BM
260
250
240
220
201
230
210
100

FIG. 14


612G
610R
611B
622G
632G
630R
620R
19_2
800
700
21
BM
260
250
240
220
230
210
201
100

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2011027712 A **[0004]**