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DISPLAY APPARATUS

Abstract

A display device includes a substrate; a first overcoat layer on the substrate; a second overcoat layer on the first overcoat layer, the second overcoat layer defining at least one open area at which the second overcoat layer is absent; an anode electrode on the second overcoat layer; an organic layer on the first overcoat layer, the second overcoat layer, and the anode electrode; and an auxiliary electrode in the at least one open area and on the first overcoat layer to be between the first overcoat layer and the organic layer, wherein the auxiliary electrode has an upper surface larger than or equal to a lower surface of the auxiliary electrode.

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims priority from Korean Patent Application No. 10-2024-0020787, filed on Feb. 14, 2024, which is hereby incorporated by reference for all purposes as if fully set forth herein.

BACKGROUND

Technical Field

[0002] The present disclosure relates to a display device.

Discussion of the Related Art

[0003] As technology has advanced, a display device for displaying image have become more integrated and thinner.

[0004] A display device may include a display panel including various elements, transistors, etc. to display images. The display panel may include a plurality of subpixels which implement different colors to display an image.

[0005] In this case, as display devices become more integrated, multiple subpixels may be arranged more densely, so the gap between adjacent subpixels may become narrow. Further, if the gap between adjacent subpixels becomes narrow, interference may occur between subpixels, and thus, it may be difficult to independently control the light emitted from the subpixels.

SUMMARY

[0006] Accordingly, embodiments of the present disclosure are directed to a display device that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0007] An aspect of the present disclosure is to provide a display device capable of blocking, or at least reducing, leakage current flowing between adjacent subpixels.

[0008] Another aspect of the present disclosure is to provide a display device capable of enabling low power consumption by preventing unnecessary power consumption.

[0009] Additional features and aspects will be set forth in the description that follows, and in part will be apparent from the description, or may be learned by practice of the inventive concepts provided herein. Other features and aspects of the inventive concepts may be realized and attained by the structure particularly pointed out in the written description, or derivable therefrom, and the claims hereof as well as the appended drawings.

[0010] To achieve these and other aspects of the inventive concepts, as embodied and broadly described herein, a display device may comprise a substrate; a first overcoat layer on the substrate; a second overcoat layer on the first overcoat layer, the second overcoat layer defining at least one open area at which the second overcoat layer is absent; an anode electrode on the second overcoat layer; an organic layer on the first overcoat layer, the second overcoat layer, and the anode electrode; and an auxiliary electrode in the at least one open area and on the first overcoat layer to be between the first overcoat layer and the organic layer, wherein the auxiliary electrode has an upper surface larger than or equal to a lower surface of the auxiliary electrode.

[0011] In another aspect, a display device, including at least a first subpixel and a second subpixel, may comprises a substrate; a first overcoat layer on the substrate; a second overcoat layer on at least a portion of the first overcoat layer; a first anode electrode on the second overcoat layer and overlapping the first subpixel; a second anode electrode on the second overcoat layer and overlapping the second subpixel; an organic layer on the first overcoat layer, the second overcoat layer, the first anode electrode, and the second anode electrode; and an auxiliary electrode on the first overcoat layer between the first overcoat layer and the organic layer, and in a plan view, between the first anode electrode and the second anode electrode, wherein a first angle between the

substrate and a side surface of the auxiliary electrode is different than a second angle between the substrate and a side surface of at least one of the first anode electrode or second anode electrode.
[0012] In another aspect, a display device may comprise a substrate; a first overcoat layer on the substrate; a second overcoat layer on the first overcoat layer, the second overcoat layer defining at least one open area at which the second overcoat layer is absent; an auxiliary electrode on the first overcoat layer and in the at least one open area; and an organic layer on the auxiliary electrode, at least a portion of the organic layer contacting both side surfaces of the auxiliary electrode.
[0013] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the inventive concepts as claimed.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0014] The accompanying drawings, which are included to provide a further understanding of the disclosure and are incorporated in and constitute a part of this application, illustrate embodiments of the disclosure and together with the description serve to explain various principles.
[0015] FIG. **1** illustrates an example of the structure of a display device and a circuit structure included in a subpixel according to embodiments of the present disclosure.
[0016] FIG. **2** illustrates an example of a planar structure of a subpixel.
[0017] FIG. **3** illustrates an example of the cross-sectional structure of portion II′ of FIG. **2**.
[0018] FIG. **4** illustrates an example of the organic layer shown in FIG. **3**.
[0019] FIG. **5** illustrates another example of a planar structure of a subpixel.
[0020] FIG. **6** illustrates an example of the cross-sectional structure of portion II-II′ of FIG. **5**.
[0021] FIG. **7** is an enlarged view of part A of FIG. **6**.
[0022] FIG. **8** illustrates another example of the cross-sectional structure of portion II-II′ of FIG. **5**.
[0023] FIG. **9** is an enlarged view of part B of FIG. **8**.
[0024] FIG. **10** illustrates an example of a planar structure of a display panel according to embodiments of the present disclosure.
[0025] FIG. **11** illustrates an example of the cross-sectional structure of portion III-III′ of FIG. **10**.
[0026] FIGS. **12**A to **12**E illustrate examples of methods for manufacturing a display device according to embodiments of the present disclosure.
DETAILED DESCRIPTION
[0027] In the following description of examples or embodiments of the present disclosure, reference will be made to the accompanying drawings in which it is shown by way of illustration specific examples or embodiments that can be implemented, and in which the same reference numerals and signs can be used to designate the same or like components even when they are shown in different accompanying drawings from one another. Further, in the following description of examples or embodiments of the present disclosure, detailed descriptions of well-known functions and components incorporated herein will be omitted when it is determined that the description may make the subject matter in some embodiments of the present disclosure rather unclear. The terms, such as “including,” “having,” “containing,” “constituting” “make up of,” and “formed of” used herein, are generally intended to allow other components to be added unless the terms are used with the term “only.” As used herein, singular forms are intended to include plural forms unless the context clearly indicates otherwise.
[0028] Terms, such as “first,” “second,” “A,” “B,” “(A),” or “(B)” may be used herein to describe elements of the present disclosure. Each of these terms is not used to define essence, order, sequence, or number of elements etc., but is used merely to distinguish the corresponding element from other elements.

[0029] When it is mentioned that a first element “is connected or coupled to,” “contacts or overlaps” etc. a second element, it should be interpreted that, not only can the first element “be directly connected or coupled to” or “directly contact or overlap” the second element, but a third element can also be “interposed” between the first and second elements, or the first and second elements can “be connected or coupled to,” “contact or overlap,” etc. each other via a fourth element. Here, the second element may be included in at least one of two or more elements that “are connected or coupled to,” “contact or overlap,” etc. each other.
[0030] When time relative terms, such as “after,” “subsequent to,” “next,” “before,” and the like, are used to describe processes or operations of elements or configurations, or flows or steps in operating, processing, manufacturing methods, these terms may be used to describe non-consecutive or non-sequential processes or operations unless the term “directly” or “immediately” is used together.
[0031] In addition, when any dimensions, relative sizes etc. are mentioned, it should be considered that numerical values for an elements or features, or corresponding information (e.g., level, range, etc.) include a tolerance or error range that may be caused by various factors (e.g., process factors, internal or external impact, noise, etc.) even when a relevant description is not specified. Further, the term “may” fully encompasses all the meanings of the term “can.”
[0032] Hereinafter, embodiments will be described in detail with reference to the accompanying drawings.
[0033] FIG. **1** illustrates an example of the structure of a display device and a circuit structure included in a subpixel according to embodiments of the present disclosure.
[0034] With reference to FIG. **1**, a plurality of subpixels SP may be disposed in a display area of a display panel **110** included in a display device **100**.
[0035] Each of the plurality of subpixels SP may include a light emitting device ED and a subpixel circuit unit configured to drive the light emitting device ED.
[0036] The subpixel circuit unit may include a driving transistor T**1** for driving the light emitting device ED, a scan transistor T**2** for transferring the data voltage VDATA to a first node N**1** of the driving transistor T**1**, and a storage capacitor Cst for maintaining a constant voltage during one frame.
[0037] The driving transistor T**1** may include a first node N**1** to which a data voltage is applied, a second node N**2** electrically connected to the light emitting device ED, and a third node N**3** to which the driving voltage VDD is applied from a driving voltage line DVL. In the driving transistor T**1**, the first node N**1** may be a gate node, the second node N**2** may be a source node or a drain node, and the third node N**3** may be a drain node or a source node. Hereinafter, for convenience of explanation, there illustrates a case in which the first node N**1** is a gate node, the second node N**2** is a source node, and the third node N**3** is a drain node in the driving transistor T**1**, as an example.
[0038] The light emitting device ED may include an anode electrode **200**, an organic layer **330**, and a cathode electrode **340**. The anode electrode **200** may be a pixel electrode disposed in each subpixel SP, and may be electrically connected to the second node N**2** of the driving transistor T**1** of each subpixel SP. The cathode electrode **340** may be a common electrode commonly disposed in the plurality of subpixels SP, and a base voltage VSS may be applied thereto.
[0039] Alternatively, the anode electrode **200** may be a common electrode, and the cathode electrode **340** may be a pixel electrode. Hereinafter, for convenience of explanation, it is assumed that anode electrode **200** is a pixel electrode and the cathode electrode **340** is a common electrode.
[0040] The light emitting device ED may have a specific emission area, and the number of emission areas may be one or more, as will be described later.
[0041] The light emitting device ED may be an organic light emitting diode (OLED), an inorganic light emitting diode, or a quantum dot light emitting device. In the case that the light emitting device ED is an organic light emitting diode, the organic layer **330** in the light emitting device ED

may include an organic light emitting layer containing an organic material.
[0042] The scan transistor T**2** may be controlled on-off by a scan signal SCAN, which is a gate signal applied through a gate line GL, and the scan transistor T**2** may be electrically connected between the first node N**1** of the driving transistor T**1** and the data line DL. The storage capacitor Cst may be electrically connected between the first node N**1** and the second node N**2** of the driving transistor T**1**.
[0043] The subpixel circuit unit may have a 2T1C structure including two transistors DT and ST and one capacitor Cst, and in some cases, may further include one or more transistors. Alternatively, the subpixel circuit unit may further include one or more capacitors.
[0044] The storage capacitor Cst may be an external capacitor intentionally designed outside the driving transistor T**1** rather than a parasitic capacitor (e.g., Cgs, Cgd) which is an internal capacitor existing between the first node N**1** and the second node N**2** of the driving transistor T**1**. Each of the driving transistor T**1** and the scan transistor T**2** may be an n-type transistor or a p-type transistor.
[0045] Circuit elements within each subpixel, in particular, light emitting devices EDs implemented with organic light-emitting diodes OLEDs containing organic materials may be vulnerable to external moisture or oxygen. Accordingly, an encapsulation layer **350** may be disposed on the display panel **110** to prevent oxygen from penetrating into the circuit elements (particularly, the light emitting devices ED). The encapsulation layer **350** may be disposed to cover the light emitting device ED.
[0046] FIG. **2** illustrates an example of a planar structure of a subpixel.
[0047] As shown in FIG. **2**, a display panel **110** may include a plurality of subpixels SP. The plurality of subpixels SP may include a first subpixel SP**1** and a second subpixel SP**2**. The first subpixel SP**1** and the second subpixel SP**2** may be one of a red subpixel, a green subpixel, and a blue subpixel, respectively.
[0048] Each of the plurality of subpixels SP may include an anode electrode. The anode electrode may include a first anode electrode **201** and a second anode electrode **202**. The first anode electrode **201** may be disposed in an area corresponding to the first subpixel SP**1**, and the second anode electrode **202** may be disposed in an area corresponding to the second subpixel SP**2**.
[0049] The first anode electrode **201** and the second anode electrode **202** may be made of the same or substantially same material, but are not limited thereto.
[0050] Each subpixel SP**1** and SP**2** may include a light emitting area or an emission area EA.
[0051] As described above, the emission area EA may be an area where an anode electrode, an organic layer, and a cathode electrode overlap.
[0052] The respective emission area EA may be formed in an area where the first anode electrode **201** of the first subpixel SP**1** is disposed, and the second anode electrode **202** of the second subpixel SP**2** is disposed.
[0053] The width of an emission area EA in one direction may be the same as or similar to the width of each anode electrode **201** and **202** in the same direction, but is not limited thereto.
[0054] A non-emission area NEA may be an area between the emission area EA of the first subpixel SP**1** and the emission area EA of the second subpixel SP**2**. A circuit for driving a light emitting device may be disposed in the non-emission area NEA.
[0055] Each anode electrode **201** and **202** of each subpixel SP**1** and SP**2** may include a contact hole in an area other than the emission area EA, and may be electrically connected to the driving transistor through the contact hole.
[0056] FIG. **3** illustrates an example of the cross-sectional structure of portion II′ of FIG. **2**. FIG. **4** illustrates an example of the organic layer shown in FIG. **3**.
[0057] As shown in FIG. **3**, the display device may include a substrate **300** on which a plurality of subpixels SP including a first subpixel SP**1** and a second subpixel SP**2** are disposed. The substrate **300** may support various components of the display device. The substrate **300** may be made of a flexible plastic material, but is not limited thereto.

[0058] A circuit element layer **310** may be disposed on the substrate **300**.
[0059] The circuit element layer **310** may include various circuit elements for driving subpixels, such as a driving transistor, a sensing transistor, a storage capacitor, a line **311**, and a buffer layer **312**.
[0060] The line **311** may be disposed on the substrate **300**, and may be a data line, a driving voltage line, or a sensing line.
[0061] The line **311** may be disposed in the non-emission area NEA.
[0062] The buffer layer **312** may be disposed on the substrate **300**, and may be disposed to cover the line **311**. The buffer layer **312** may prevent ions or impurities from diffusing from the substrate **300** and may block moisture penetration. Additionally, the buffer layer **312** may improve surface flatness. The buffer layer **312** may include an inorganic material, such as oxide or nitride, an organic material, or an organic-inorganic composite, and may be formed in a single-layer or multi-layer structure. For example, the buffer layer **312** may have a triple (or more) layer structure composed of silicon oxide, silicon nitride, and silicon oxide.
[0063] The circuit element layer **310** may include an active layer (not shown), a gate insulating layer (not shown), and a plurality of electrodes (not shown).
[0064] The active layer may be disposed on the buffer layer **312**. The active layer may be formed of a silicon-based semiconductor material or an oxide-based semiconductor material. The active layer may include a source area, a drain area, and a channel area between the source area and the drain area.
[0065] The gate insulating layer may be disposed on the active layer.
[0066] A plurality of electrodes may be disposed on the gate insulating layer. The plurality of electrodes may include a gate electrode, a source electrode, and a drain electrode.
[0067] A color filter (not shown) may be disposed on the buffer layer **312**. The color filter may be disposed between the buffer layer **312** and a first overcoat layer **321**, and may be disposed to overlap the emission area EA of each subpixel SP**1** and SP**2**.
[0068] An overcoat layer **320** may be disposed on the buffer layer **312**.
[0069] The overcoat layer **320** may include a first overcoat layer **321** and a second overcoat layer **322**. The overcoat layer **320** may include organic materials, such as polyimide, benzocyclobutene series resin, and acrylate, but is not limited thereto. The overcoat layer **320** may prevent gas generated within the display device from being delivered to the light emitting device ED.
[0070] The first overcoat layer **321** may be disposed on the buffer layer **312**.
[0071] The second overcoat layer **322** may be disposed on the first overcoat layer **321**. The second overcoat layer **322** may be disposed to overlap the first subpixel SP**1**, and may be disposed to overlap the second subpixel SP**2**.
[0072] The second overcoat layer **322** may have an opening area OA in at least some areas on the first overcoat layer **321**, for example, in areas that do not overlap the first subpixel SP**1** and the second subpixel SP**2**.
[0073] The opening area OA may be formed in the non-emission area NEA. At least a portion of the second overcoat layer **322** may have a curved surface around the opening area OA, but is not limited thereto.
[0074] The first anode electrode **201** and the second anode electrode **202** may be disposed on the second overcoat layer **322**.
[0075] The first anode electrode **201** and the second anode electrode **202** may be made of a transparent conductive material capable of transmitting light. For example, the first anode electrode **201** and the second anode electrode **202** may be formed of at least one of indium tin oxide (ITO) and indium zinc oxide (IZO), however, is not limited thereto.
[0076] The first anode electrode **201** may be disposed on the second overcoat layer **322** in an area corresponding to the first subpixel SP**1**, and the second anode electrode **202** may be disposed on the second overcoat layer **322** in an area corresponding to the second subpixel SP**2**. The width of

the first anode electrode **201** and the second anode electrode **202** may be the same as or similar to the width of the emission area EA, but is not limited thereto. Each anode electrode **201** and **202** may not be disposed in the opening area of the second overcoat layer **322**.

[0077] The organic layer **330** may be disposed on the first anode electrode **201**, the first overcoat layer **321**, the second overcoat layer **322**, and the second anode electrode **202**. The organic layer **330** may include a plurality of intermediate layers **331** and a plurality of charge generation layers **332**. The organic layer **330** may be in the form of a plurality of intermediate layers **331** and a plurality of charge generation layers **332** alternately stacked. The structure of FIG. **3** is more simple to manufacture and allows a smaller pixel density.

[0078] As illustrated in FIG. **4**, the organic layer **330** may be disposed between the anode electrode **200** and the cathode electrode **340**.

[0079] The plurality of intermediate layers **331** may include a first intermediate layer **331***a*, a second intermediate layer **331***b* on the first intermediate layer **331***a*, a third intermediate layer **331***c* on the second intermediate layer **331***b*, and a fourth intermediate layer **331***d* on the third intermediate layer **331***c*.

[0080] In FIGS. **3** and **4**, the organic layer **330** is shown as having four intermediate layers **331**, but it is not limited thereto, and the organic layer **330** may include two or three or more intermediate layers **331**.

[0081] The plurality of charge generation layers **332** may include a first charge generation layer **332***a*, a second charge generation layer **332***b* on the first charge generation layer **332***a*, and a third charge generation layer **332***c* on the second charge generation layer **332***b*. In FIGS. **3** and **4**, the organic layer **330** is shown as having three charge generation layers **332**, but it is not limited thereto, and the organic layer **330** may include one or two charge generation layers **332**. For example, the first intermediate layer **331***a* may be disposed on the anode electrode **200**. The first intermediate layer **331***a* may be formed as a structure in which a first hole injection layer HIL**1**, a first hole transport layer HTL**1**, a first emission layer EML**1** emitting light of a first color, and a first electron transport layer ETL**1** are sequentially stacked, but is not limited thereto. The first emission layer EML**1** may be at least one of a red emission layer emitting red light, a green emission layer emitting green light, a blue emission layer emitting blue light, and a yellow emission layer emitting yellow light, but is not limited thereto.

[0082] The first charge generation layer **332***a* may be disposed on the first intermediate layer **331***a*. The first charge generation layer **332***a* may be a structure in which an N-type charge generation layer for providing electrons to the first intermediate layer **331***a* and a P-type charge generation layer for providing holes to the second intermediate layer **331***b* are stacked.

[0083] The second intermediate layer **331***b* may be disposed on the first charge generation layer **332***a*. The second intermediate layer **331***b* may be formed as a structure in which a second hole injection layer HTL**2**, a second emission layer EML**2** emitting light of a second color, a second electron transport layer ETL**2**, and a second electron injection layer EIL**2** are sequentially stacked, but is not limited thereto. The second emission layer EML**2** may emit light of a different color than the first emission layer EML**1**. For example, the first emission layer EML**1** may be a blue emission layer that emits blue light, and the second emission layer EML**2** may be a yellow emission layer that emits yellow light.

[0084] The second charge generation layer **332***b* may be disposed on the second intermediate layer **331***b*.

[0085] The third intermediate layer **331***c* may be disposed on the second charge generation layer **332***b*. The third intermediate layer **331***c* may be formed as a structure in which a third hole transport layer HTL**3**, a third emission layer EML**3** emitting light of a third color, a third electron transport layer ETL**3**, and a third electron injection layer EIL**3** are sequentially stacked, but is not necessarily limited thereto.

[0086] The third charge generation layer **332***c* may be disposed on the third intermediate layer

331*c*.
[0087] The fourth intermediate layer **331***d* may be disposed on the third charge generation layer **332***c*. The fourth intermediate layer **331***d* may be formed as a structure in which a fourth hole transport layer HTL**4**, a fourth emission layer EML**4** emitting light of a fourth color, a fourth electron transport layer ETL**4**, and a fourth electron injection layer EIL**4** are sequentially stacked, but is not necessarily limited thereto.
[0088] A cathode electrode **340** may be disposed on the fourth intermediate layer **331***d*. The cathode electrode **340** may be a reflective electrode which reflects light, and may be made of an opaque conductive material. For example, the cathode electrode **340** may be formed of at least one of silver (Ag), aluminum (Al), gold (Au), molybdenum (Mo), tungsten (W), chromium (Cr), or alloys thereof, but is not limited thereto.
[0089] With reference again to FIG. **3**, an encapsulation layer **350** may be disposed on the cathode electrode **340**.
[0090] The encapsulation layer **350** may prevent moisture or oxygen from penetrating into the light emitting device ED. The encapsulation layer **350** may be formed by an organic encapsulation layer and an inorganic encapsulation layer alternately stacked.
[0091] The encapsulation layer **350** may include a first encapsulation layer **351**, a second encapsulation layer **352**, and a third encapsulation layer **353**. Here, the first encapsulation layer **351** and the third encapsulation layer **353** may be inorganic encapsulation layers, and the second encapsulation layer **352** may be an organic encapsulation layer, but are not limited thereto.
[0092] In the above-described display device, the organic layer **330** may be disposed to cover both the first subpixel SP**1** and the second subpixel SP**2**, and may cover the entire area between the first subpixel SP**1** and the second subpixel SP**2**. For example, the organic layer **330** may be disposed to extend from the first subpixel SP**1** to the second subpixel SP**2**.
[0093] As the organic layer **330** extends from the first subpixel SP**1** to the second subpixel SP**2**, when a data voltage is supplied to the first subpixel SP**1** to drive the first subpixel SP**1**, a part of the current flowing in the first subpixel SP**1** may leak and flow into the second subpixel SP**2** through the organic layer **330**.
[0094] In this case, because the charge generation layers **332***a*, **332***b* and **332***c* of the organic layer **330** have low resistance, most of the leaked current may flow along the charge generation layers **332***a*, **332***b* and **332***c*.
[0095] Accordingly, even when the second subpixel SP**2** is not driven, for example, even when the data voltage is not supplied to the second subpixel SP**2**, the light may be emitted from the emission area included in the second subpixel SP**2** due to leakage current leaked from the first subpixel SP**1**.
[0096] For example, light may be emitted from a subpixel that does not require light emission due to adjacent emitting subpixels, so that there may be difficult to independently control the light emission of each subpixel.
[0097] Hereinafter, it will be described a method for blocking, or at least reducing, leakage current flowing between adjacent subpixels with reference to the drawings.
[0098] FIG. **5** illustrates another example of a planar structure of a subpixel.
[0099] In describing this embodiment, it will be omitted description of components that are substantially the same as or corresponding to the previous embodiment.
[0100] As shown in FIG. **5**, an auxiliary electrode **500** may be disposed between the first subpixel SP**1** and the second subpixel SP**2**.
[0101] For example, the auxiliary electrode **500** may be disposed in the non-emission area NEA. In addition, the auxiliary electrode **500** may be disposed between the first anode electrode **201** and the second anode electrode **202**. For example, the auxiliary electrode **500** may not overlap the first anode electrode **201** and the second anode electrode **202**.
[0102] The auxiliary electrode **500** may be made of the same material as the first anode electrode **201** or the second anode electrode **202**. For example, the auxiliary electrode **500** may be made of a

transparent conductive material that transmits light. For example, the auxiliary electrode **500** may be formed of at least one of indium tin oxide (ITO) and indium zinc oxide (IZO), but is not limited thereto.

[0103] The auxiliary electrode **500** may extend in a direction perpendicular to a direction extending from the first subpixel SP**1** to the second subpixel SP**2**.

[0104] In FIG. **5**, the auxiliary electrode **500** is shown to be disposed only between the first subpixel SP**1** and the second subpixel SP**2**, but is not limited thereto, and the auxiliary electrode **500** may also be disposed between other adjacent subpixels.

[0105] The auxiliary electrode **500** may extend to a non-display area where subpixels are not arranged. However, embodiments are not limited to such.

[0106] FIG. **6** illustrates an example of the cross-sectional structure of portion II-II′ of FIG. **5**. FIG. **7** is an enlarged view of part A of FIG. **6**.

[0107] In describing this embodiment, it will be omitted description of components that are substantially the same as or corresponding to the previous embodiment.

[0108] With reference to FIG. **6**, the auxiliary electrode **500** may be disposed on the first overcoat layer **321** in the opening area OA of the second overcoat layer **322**.

[0109] The first anode electrode **201** and the second anode electrode **202** may be disposed on the second overcoat layer **322** in areas overlapping with the first subpixel SP**1** and the second subpixel SP**2**, respectively. The first anode electrode **201** and the second anode electrode **202** may not be located in the opening area OA of the second overcoat layer **322**, but is not limited thereto. Because the first anode electrode **201** and the second anode electrode **202** are located on the second overcoat layer **322**, the emission area EA of the first subpixel SP**1** and the second subpixel SP**2** may overlap the area where the second overcoat layer **322** is disposed.

[0110] The auxiliary electrode **500** may be located below the first anode electrode **201** or the second anode electrode **202**.

[0111] For example, a vertical distance from the auxiliary electrode **500** to the substrate **300** may be smaller than a vertical distance from the first anode electrode **201** or the second anode electrode **202** to the substrate **300**.

[0112] The area of an upper surface of the auxiliary electrode **500** may be larger than the area of a lower surface. With respect to a plane parallel to the substrate **300**, a cross-sectional area of the auxiliary electrode **500** at the upper surface may be larger than a cross-sectional area of the auxiliary electrode **500** at the lower surface. Alternatively, an internal angle between the side surface of the auxiliary electrode **500** and the substrate may be 90 degrees or more. For example, the auxiliary electrode **500** may have an inverted trapezoid shape.

[0113] The area of an upper surface of the first anode electrode **201** may be smaller than the area of a lower surface, and the area of the upper surface of the second anode electrode **202** may be smaller than the area of the lower surface. Alternatively, an internal angle formed by the side surface of the first anode electrode **201** or the side surface of the second anode electrode **202** with the substrate may be 90 degrees or less. For example, the first anode electrode **201** and the second anode electrode **202** may each have a trapezoidal shape.

[0114] Because the first anode electrode **201** and the second anode electrode **202** have a trapezoidal shape, the organic layer **330** may be not disconnected around the first anode electrode **201** and the second anode electrode **202**. For example, when forming the organic layer **330** on the first anode electrode **201** and the second anode electrode **202**, the lowest layer of the organic layer **330** may cover both side surfaces of the first anode electrode **201** and the second anode electrode **202**.

[0115] However, because the auxiliary electrode **500** has an inverted trapezoidal shape, the organic layer **330** may be disconnected, or have a discontinuity, around the auxiliary electrode **500**. For example, when forming the organic layer **330** on the auxiliary electrode **500**, the lowest layer of the organic layer **330** may not cover the side surface of the auxiliary electrode **500**. For example, the organic layer **330** disposed on the auxiliary electrode **500** may be **331***a***1** or **332***a***1**, which is part of

the first intermediate layer **331***a* or the first charge generation layer **332***a*.
[0116] With further reference to FIGS. **6** and **7**, the first intermediate layer **331***a* and the first charge generation layer **332***a* may be disconnected around the auxiliary electrode **500**.
[0117] Because the first intermediate layer **331***a* is disconnected, a portion of the first intermediate layer **331***a* may contact an upper surface of the auxiliary electrode **500**, but may not contact both side surfaces of the auxiliary electrode **500**.
[0118] The first intermediate layer **331***a* may be partially disposed on the second overcoat layer **322**. Additionally, at least a portion of the first intermediate layer **331***a* may be disposed on the first overcoat layer **321**.
[0119] The first intermediate layer **331***a* may be in contact with an upper surface of the second overcoat layer **322**, and may be in contact with an upper surface of the first overcoat layer **321** in the opening area OA of the second overcoat layer **322**.
[0120] The first charge generation layer **332***a* may be disposed on the first intermediate layer **331***a* along a step of the first intermediate layer **331***a*.
[0121] At least a portion of the first charge generation layer **332***a* may contact an upper surface of the first overcoat layer **321** in the opening area OA of the second overcoat layer **322**.
[0122] Because the first charge generation layer **332***a* is disconnected around the auxiliary electrode **500**, the first charge generation layer **332***a* may not contact either side surfaces of the auxiliary electrode **500**. For example, the first charge generation layer **332***a* may be spaced apart from the auxiliary electrode **500**.
[0123] In addition, the first charge generation layer **332***a* may be spaced apart from a portion of the first charge generation layer **332***a* located on the auxiliary electrode **500**.
[0124] The second intermediate layer **331***b* may be disposed on the first charge generation layer **332***a*. The second intermediate layer **331***b* may fill the space between the first charge generation layer **332***a* and the auxiliary electrode **500**.
[0125] As the second intermediate layer **331***b* fills the space between the first charge generation layer **332***a* and the auxiliary electrode **500**, the second intermediate layer **331***b* may contact both side surfaces of the auxiliary electrode **500**. In addition, the second intermediate layer **331***b* may cover a portion of the first intermediate layer **331***a* and a portion of the first charge generation layer **332***a* located on an upper surface of the auxiliary electrode **500**.
[0126] With reference to FIG. **7**, because the first charge generation layer **332***a* is not continuous, around the auxiliary electrode **500**, the current leaked from the first subpixel SP**1** may not reach the second subpixel SP**2**.
[0127] As described above, because the first charge generation layer **332***a* has a small resistance, most of the leakage current flowing from the first subpixel SP**1** to the second subpixel SP**2** through the organic layer **330** may be transferred through the first charge generation layer **332***a*. Accordingly, when the first charge generation layer **332***a* is not continuous as described above, it is possible to block, or at least to reduce, the leakage current flowing between adjacent subpixels.
[0128] In addition, in FIGS. **6** and **7**, only the first intermediate layer **331***a* and the first charge generation layer **332***a* are shown to be disconnected (not continuous), but is not limited thereto. The second intermediate layer **331***b*, the second charge generation layer **332***b*, the third intermediate layer **331***c*, the third charge generation layer **332***c*, and the fourth intermediate layer **331***d* may be all disconnected (not continuous), or the third intermediate layer **331***c* and the third charge generation layer **332***c* may be disconnected (not continuous), or the second intermediate layer **331***b* and the second charge generation layer **332***b* may be disconnected (not continuous), or any combination of first, second, third and/or fourth intermediate layers, and/or first, second and and/or third charge generation layers may be disconnected (not continuous).
[0129] FIG. **8** illustrates another example of the cross-sectional structure of portion II-II′ of FIG. **5**. FIG. **9** is an enlarged view of part B of FIG. **8**.
[0130] In describing this embodiment, it will be omitted description of components that are

substantially the same as or corresponding to the previous embodiment.
[0131] As shown in FIG. **8**, the auxiliary electrode **500** may be located within the opening area OA of the second overcoat layer **322**.
[0132] The auxiliary electrode **500** may be disposed on the first overcoat layer **321** between the first subpixel SP**1** and the second subpixel SP**2**.
[0133] The area of the upper surface of the auxiliary electrode **500** may be equal to the area of the lower surface. With respect to a plane parallel to the substrate **300**, a cross-sectional area of the auxiliary electrode **500** at the upper surface may be substantially the same as a cross-sectional area of the auxiliary electrode **500** at the lower surface. Alternatively, the angle between the side surface of the auxiliary electrode **500** and the substrate may be 90 degrees. For example, the auxiliary electrode **500** may have a rectangular shape.
[0134] Because the auxiliary electrode **500** has a rectangular shape, the organic layer **330** may not be disconnected (may be continuous) around the auxiliary electrode **500**. For example, when forming the organic layer **330** on the auxiliary electrode **500**, the lowest layer of the organic layer **330** may cover all side surfaces of the auxiliary electrode **500**.
[0135] With further reference to FIGS. **8** and **9**, the first intermediate layer **331***a* may cover all of the auxiliary electrodes **500**.
[0136] The first intermediate layer **331***a* may be partially disposed on the second overcoat layer **322**. Additionally, at least a portion of the first intermediate layer **331***a* may be disposed on the first overcoat layer **321**. The first intermediate layer **331***a* may be in contact with the upper surface of the second overcoat layer **322**, and may be in contact with the upper surface of the first overcoat layer **321** in the opening area OA of the second overcoat layer **322**.
[0137] In addition, the first intermediate layer **331***a* may contact both the upper surface and both side surfaces of the auxiliary electrode **500**.
[0138] The first charge generation layer **332***a* may be disposed on the first intermediate layer **331***a* along a step of the first intermediate layer **331***a*.
[0139] With reference to FIG. **9**, because the first intermediate layer **331***a* is in contact with the side surface of the auxiliary electrode **500**, and the first charge generation layer **332***a* is disposed on the first intermediate layer **331***a*, a part of the current which leaks from the first subpixel SP**1** and flows through the first charge generation layer **332***a* may pass through the first intermediate layer **331***a* and may flow to the auxiliary electrode **500** through the side surface of the auxiliary electrode **500**.
[0140] As will be described later, because the auxiliary electrode **500** may be electrically connected to the cathode electrode **340** and receive a base voltage, the current flowing through the auxiliary electrode **500** may not flow back to the first charge generation layer **332***a* and may be removed in the middle as shown in FIG. **9**.
[0141] Therefore, it is possible to block, or at least to reduce, the leakage current flowing from the first subpixel SP**1** to the second subpixel SP**2**.
[0142] FIG. **10** illustrates an example of a planar structure of a display panel according to embodiments of the present disclosure.
[0143] As illustrated in FIG. **10**, a display panel **110** may be connected to a data driver **1000**. The data driver **1000** is a circuit for driving a plurality of data lines, and may output data signals through the plurality of data lines.
[0144] The data driver **1000** may receive digital image data DATA from a timing controller, convert the received image data DATA into an analog data signal, and output to a plurality of data lines.
[0145] In FIG. **10**, the data driver **1000** is illustrated to be connected to the display panel **110** through a film **1010** in a chip-on-film (COF) method, but is not limited thereto. The data driver **1000** may be connected to the display panel **110** using a tape automated bonding (TAB) method, or may be connected to a bonding pad of the display panel **110** using a chip-on-glass (COG) method or a chip-on-panel (COP) method.

[0146] The plurality of auxiliary electrodes **500** may be disposed to at least partially overlap the display area AA of the display panel **110**.
[0147] The display area AA may refer to an area where a plurality of subpixels SP are arranged. The auxiliary electrodes **500** may be disposed between a plurality of subpixels SP within the display area AA. The auxiliary electrodes **500** may overlap with a data line or a reference voltage line, but are not limited thereto.
[0148] A non-display area NA may surround the display area AA outside the display area AA.
[0149] A part of the auxiliary electrodes **500** may be disposed in the non-display area NA. However, embodiments are not limited thereto, and the auxiliary electrodes **500** may be disposed only within the display area AA. The auxiliary electrodes **500** may be electrically connected to the cathode electrode in the non-display area NA.
[0150] FIG. **11** illustrates an example of the cross-sectional structure of portion III-III′ of FIG. **10**.
[0151] As shown in FIG. **11**, a buffer layer **312** may be disposed on the substrate **300**, a first overcoat layer **321** may be disposed on the buffer layer **312**, and the auxiliary electrode **500** may be disposed on the first overcoat layer **321**.
[0152] An organic layer **330** and a cathode electrode **340** may be disposed on the auxiliary electrode **500**.
[0153] In the display area AA, the organic layer **330** may be disposed on the auxiliary electrode **500**.
[0154] The organic layer **330** may include a plurality of intermediate layers **331** and a plurality of charge generation layers **332**, as described above. The organic layer **330** may be partially disposed in the non-display area NA. The cathode electrode **340** may be disposed on the organic layer **330**.
[0155] In the display area AA, the cathode electrode **340** may be separated from the auxiliary electrode **500**. The organic layer **330** may be disposed between the cathode electrode **340** and the auxiliary electrode **500** in the display area AA.
[0156] In at least a portion of the non-display area NA, the cathode electrode **340** may be electrically connected to the auxiliary electrode **500**.
[0157] In at least a portion of the non-display area NA, an upper surface of the auxiliary electrode **500** may contact a lower surface of the cathode electrode **340**. However, the present embodiment is not limited thereto, and the cathode electrode **340** may be electrically connected to the auxiliary electrode **500** in the display area AA.
[0158] The base voltage may be supplied to the cathode electrode **340**. Because the cathode electrode **340** is electrically connected to the auxiliary electrode **500**, the auxiliary electrode **500** may receive the base voltage. For example, leakage current generated in at least one subpixel may be removed by the auxiliary electrode **500** disposed adjacent to the subpixel.
[0159] FIGS. **12**A to **12**E illustrate examples of methods for manufacturing a display device according to embodiments of the present disclosure.
[0160] As shown in FIG. **12**A, a line **311** and a buffer layer **312** may be formed on a substrate **300**, a first overcoat layer **321** may be formed on the buffer layer **312**, and a second overcoat layer **322** may be formed on the first overcoat layer **321**.
[0161] Here, the first overcoat layer **321** may be made of a hydrophilic material, and the second overcoat layer **322** may be made of a hydrophobic material. However, the present embodiment is not limited thereto, and the second overcoat layer **322** may be made of a hydrophilic material.
[0162] In the case that the second overcoat layer **322** is made of a hydrophilic material, a surface of the second overcoat layer **322** may be modified by plasma treatment using hydrogen (H2) gas. If the plasma treatment is performed on the upper surface of the second overcoat layer **322**, a thin hydrophobic film may be formed on the upper surface of the second overcoat layer **322**.
[0163] With reference to FIG. **12**B, a photoresist (PR) **1200** may be formed on the second overcoat layer **322**.
[0164] The photoresist **1200** may expose at least a portion of the upper surface of the second

overcoat layer **322**.
[0165] With reference to FIG. **12**C, the second overcoat layer **322** disposed in the area where the photoresist **1200** is not formed may be etched through an ashing process, and the photoresist **1200** may be removed.
[0166] Accordingly, an opening area OA may be formed in at least a portion of the first overcoat layer **321**. The opening area OA may be an area between adjacent subpixels, for example, an area included in a non-emission area, but is not limited thereto.
[0167] As shown in FIG. **12**D, the first anode electrode **201** and the second anode electrode **202** may be formed on the second overcoat layer **322**. The first anode electrode **201** may correspond to the first subpixel SP**1**, and the second anode electrode **202** may correspond to the second subpixel SP**2**.
[0168] Because the first anode electrode **201** and the second anode electrode **202** are formed on the second overcoat layer **322** made of a hydrophobic material, they may be better bonded to the second overcoat layer **322** by a hydrophobic bond. Accordingly, during the etching process, the etchant may not penetrate between the first anode electrode **201** and the second overcoat layer **322** or between the second anode electrode **202** and the second overcoat layer **322**, so that the upper portions of the first anode electrode **201** and the second anode electrode **202** may be etched more than the lower portions.
[0169] Therefore, the size of the upper surface of the first anode electrode **201** and the second anode electrode **202** may be smaller than the size of the lower surface. Alternatively, the internal angle formed by each side surface of the first anode electrode **201** and the side surface of the second anode electrode **202** with the substrate **300** may be less than 90 degrees.
[0170] An auxiliary electrode **500** may be formed on the first overcoat layer **321** in the opening area OA.
[0171] The auxiliary electrode **500** may be formed using the same mask as a mask forming the first anode electrode **201** and the second anode electrode **202**. The auxiliary electrode **500** may be made of the same material as the first anode electrode **201** and the second anode electrode **202**, however, is not limited thereto.
[0172] Here, the first overcoat layer **321** may be made of a hydrophilic material. The auxiliary electrode **500** formed on the first overcoat layer **321** in the opening area OA does not form a hydrophobic bond with the first overcoat layer **321**, and therefore may be not sufficiently bonded with the first overcoat layer **321**. Accordingly, during the etching process, the etchant may easily penetrate between the auxiliary electrode **500** and the first overcoat layer **321**, so the lower portion of the auxiliary electrode **500** may be etched more than the upper portion.
[0173] Therefore, the size of the upper surface of the auxiliary electrode **500** may be larger than the size of the lower surface. Alternatively, the angle formed by the side surface of the auxiliary electrode **500** and the substrate **300** may be 90 degrees or more.
[0174] With reference to FIG. **12**E, an organic layer **330** may be formed on the first anode electrode **201**, the second anode electrode **202**, and the auxiliary electrode **500**. Because the size of the upper surface of the first anode electrode **201** and the second anode electrode **202** is smaller than the size of the lower surface, when the organic layer **330** is formed, the organic layer **330** may not be disconnected around the area where the first anode electrode **201** and the second anode electrode **202** are disposed.
[0175] However, because the size of the upper surface of the auxiliary electrode **500** is larger than the size of the lower surface, when the organic layer **330** is formed, at least a portion of the organic layer **330** may be disconnected around the area where the auxiliary electrode **500** is disposed.
[0176] For example, as shown in FIG. **12**E, the first intermediate layer **331***a* and the first charge generation layer **332***a* may be disconnected around the auxiliary electrode **500**, but is not limited thereto. In addition, the second intermediate layers **331***b* to fourth intermediate layers **331***d*, the second charge generation layer **332***b*, and the third charge generation layer **332***c* may be also

disconnected around the auxiliary electrode **500**, or any combination of first, second, third and/or fourth intermediate layers, and/or first, second and/or third charge generation layers may be disconnected (not continuous) around the auxiliary electrode **500**.

[0177] In an embodiment according to the present disclosure, at least one of the first charge generation layer **332***a*, the second charge generation layer **332***b*, and the third charge generation layer **332***c* may be disconnected around the auxiliary electrode **500**, so that the leakage current which leaks from the first subpixel SP**1** or the second subpixel SP**2** and flows along each charge generation layer may not flow to adjacent subpixels and may be blocked or at least reduced.

[0178] The embodiments of the present disclosure described above are briefly described as follows.

[0179] According to an embodiment of the present disclosure, there may provide a display device including a substrate, a first overcoat layer on the substrate, a second overcoat layer on the first overcoat layer and defining at least one open area at which the overcoat layer is absent, an anode electrode on the second overcoat layer, an organic layer on the first overcoat layer, the second overcoat layer, and the anode electrode, and an auxiliary electrode in the at least one open area and on the first overcoat layer to be between the first overcoat layer. The auxiliary electrode may have an upper surface larger than or equal to a lower surface of the auxiliary electrode.

[0180] In the display device according to an embodiment of the present disclosure, the organic layer may contact an upper surface of the second overcoat layer.

[0181] In the display device according to an embodiment of the present disclosure, at least a portion of the organic layer may contact at least a portion of a side surface of the auxiliary electrode.

[0182] In the display device according to an embodiment of the present disclosure, the organic layer may include a first charge generation layer and a second charge generation layer on the first charge generation layer, and the first charge generating layer may be disconnected around the auxiliary electrode.

[0183] In the display device according to an embodiment of the present disclosure, the organic layer may include a first intermediate layer and a second intermediate layer on the first intermediate layer, and at least a portion of the second intermediate layer may contact at least a portion of a side surface of the auxiliary electrode.

[0184] In the display device according to an embodiment of the present disclosure, the organic layer may include a first intermediate layer and a second intermediate layer on the first intermediate layer, and at least a portion of the first intermediate layer may contact at least a portion of a side surface of the auxiliary electrode.

[0185] In the display device according to an embodiment of the present disclosure, the substrate may includes a display area where a subpixel is disposed and a non-display area around the display area. The display device may further include a cathode electrode disposed separately from the auxiliary electrode in the display area, and electrically connected to at least a portion of the auxiliary electrode in the non-display area.

[0186] In the display device according to an embodiment of the present disclosure, a vertical distance from the auxiliary electrode to the substrate may be smaller than a vertical distance from the anode electrode to the substrate.

[0187] In the display device according to an embodiment of the present disclosure, the anode electrode may be disposed in an area other than the open area.

[0188] According to an embodiment of the present disclosure, a display device including at least a first subpixel and a second subpixel, may comprise a substrate, a first overcoat layer on the substrate, a second overcoat layer on at least a portion of the first overcoat layer, a first anode electrode on the second overcoat layer and overlapping the first subpixel, a second anode electrode on the second overcoat layer and overlapping the second subpixel, an organic layer on the first overcoat layer, the second overcoat layer, the first anode electrode, and the second anode electrode, and an auxiliary electrode on the first overcoat layer between the first overcoat layer and the

organic layer, and, in a plan view, between the first anode electrode and the second anode electrode. A first angle between the substrate and a side surface of the auxiliary electrode may be different than a second angle between the substrate and a side surface of at least one of the first anode electrode or second anode electrode.

[0189] In the display device according to an embodiment of the present disclosure, the first angle may be greater than the second angle.

[0190] In the display device according to an embodiment of the present disclosure, the organic layer may contact an upper surface of the second overcoat layer.

[0191] In the display device according to an embodiment of the present disclosure, at least a portion of the organic layer may contact at least a portion of a side surface of the auxiliary electrode.

[0192] In the display device according to an embodiment of the present disclosure, the organic layer may include a first charge generation layer and a second charge generation layer on the first charge generation layer, and the first charge generating layer may be disconnected around the auxiliary electrode.

[0193] In the display device according to an embodiment of the present disclosure, the organic layer may include a first intermediate layer and a second intermediate layer on the first intermediate layer, and at least a portion of the first intermediate layer may contact at least a portion of a side surface of the auxiliary electrode.

[0194] According to an embodiment of the present disclosure, there may provide a display device including a substrate, a first overcoat layer on the substrate, a second overcoat layer on the first overcoat layer and defining at least one open area at which the second overcoat layer is absent, an auxiliary electrode on the first overcoat layer and in the at least one open area, and an organic layer on the auxiliary electrode, at least a portion of the organic layer contacting both side surfaces of the auxiliary electrode.

[0195] In the display device according to an embodiment of the present disclosure, the organic layer may include a first intermediate layer and a second intermediate layer on the first intermediate layer, and at least a portion of the second intermediate layer may contact at least a portion of both side surfaces of the auxiliary electrode.

[0196] In the display device according to an embodiment of the present disclosure, the organic layer may include a first intermediate layer and a second intermediate layer on the first intermediate layer, and at least a portion of the first intermediate layer may contact at least a portion of both side surfaces of the auxiliary electrode.

[0197] In the display device according to an embodiment of the present disclosure, an angle formed between the side surface of the auxiliary electrode and the substrate may be greater than an angle formed between the side surface of the first anode electrode or the side surface of the second anode electrode and the substrate.

[0198] In the display device according to an embodiment of the present disclosure, with respect to a plane parallel to an upper surface of the substrate, a cross-sectional area of the auxiliary electrode at an upper surface thereof may be larger than or equal to a cross-sectional area of the auxiliary electrode at the lower surface thereof.

[0199] In the display device according to an embodiment of the present disclosure, the auxiliary electrode may have an upper surface larger than or equal to a lower surface of the auxiliary electrode.

[0200] It will be apparent to those skilled in the art that various modifications and variations can be made in the display device of the present disclosure without departing from the technical idea or scope of the disclosure. Thus, it is intended that the present disclosure cover the modifications and variations of this disclosure provided they come within the scope of the appended claims and their equivalents.

Claims

1. A display device, comprising: a substrate; a first overcoat layer on the substrate; a second overcoat layer on the first overcoat layer, the second overcoat layer defining at least one open area at which the second overcoat layer is absent; an anode electrode on the second overcoat layer; an organic layer on the first overcoat layer, the second overcoat layer, and the anode electrode; and an auxiliary electrode in the at least one open area and on the first overcoat layer to be between the first overcoat layer and the organic layer, wherein the auxiliary electrode has an upper surface larger than or equal to a lower surface of the auxiliary electrode.
2. The display device of claim 1, wherein the organic layer contacts an upper surface of the second overcoat layer.
3. The display device of claim 1, wherein at least a portion of the organic layer contacts at least a portion of a side surface of the auxiliary electrode.
4. The display device of claim 1, wherein the organic layer includes a first charge generation layer and a second charge generation layer on the first charge generation layer, and wherein the first charge generating layer is disconnected around the auxiliary electrode.
5. The display device of claim 1, wherein the organic layer includes a first intermediate layer and a second intermediate layer on the first intermediate layer, and wherein at least a portion of the second intermediate layer contacts at least a portion of a side surface of the auxiliary electrode.
6. The display device of claim 1, wherein the organic layer includes a first intermediate layer and a second intermediate layer on the first intermediate layer, and wherein at least a portion of the first intermediate layer contacts at least a portion of a side surface of the auxiliary electrode.
7. The display device of claim 1, wherein the substrate includes a display area where a subpixel is disposed and a non-display area around the display area, and wherein the display device further comprises a cathode electrode disposed separately from the auxiliary electrode in the display area, and electrically connected to at least a portion of the auxiliary electrode in the non-display area.
8. The display device of claim 1, wherein a vertical distance from the auxiliary electrode to the substrate is smaller than a vertical distance from the anode electrode to the substrate.
9. The display device of claim 1, wherein the anode electrode is in an area other than the open area.
10. A display device including at least a first subpixel and a second subpixel, the display device comprising: a substrate; a first overcoat layer on the substrate; a second overcoat layer on at least a portion of the first overcoat layer; a first anode electrode on the second overcoat layer and overlapping the first subpixel; a second anode electrode on the second overcoat layer and overlapping the second subpixel; an organic layer on the first overcoat layer, the second overcoat layer, the first anode electrode, and the second anode electrode; and an auxiliary electrode on the first overcoat layer between the first overcoat layer and the organic layer, and in a plan view, between the first anode electrode and the second anode electrode, wherein a first angle between the substrate and a side surface of the auxiliary electrode is different than a second angle between the substrate and a side surface of at least one of the first anode electrode or second anode electrode.
11. The display device of claim 10, wherein the first angle is greater than the second angle.
12. The display device of claim 10, wherein the organic layer contacts an upper surface of the second overcoat layer.
13. The display device of claim 10, wherein at least a portion of the organic layer contacts at least a portion of a side surface of the auxiliary electrode.
14. The display device of claim 10, wherein the organic layer includes a first charge generation layer and a second charge generation layer on the first charge generation layer, and wherein the first charge generating layer is disconnected around the auxiliary electrode.
15. The display device of claim 10, wherein the organic layer includes a first intermediate layer and a second intermediate layer on the first intermediate layer, and wherein at least a portion of the first

intermediate layer contacts at least a portion of a side surface of the auxiliary electrode.

16. A display device, comprising: a substrate; a first overcoat layer on the substrate; a second overcoat layer on the first overcoat layer, the second overcoat layer defining at least one open area at which the second overcoat layer is absent; an auxiliary electrode on the first overcoat layer and in the at least one open area; and an organic layer on the auxiliary electrode, at least a portion of the organic layer contacting both side surfaces of the auxiliary electrode.

17. The display device of claim 16, wherein the organic layer includes a first intermediate layer and a second intermediate layer on the first intermediate layer, and wherein at least a portion of the second intermediate layer contacts at least a portion of both side surfaces of the auxiliary electrode.

18. The display device of claim 16, wherein the organic layer includes a first intermediate layer and a second intermediate layer on the first intermediate layer, and wherein at least a portion of the first intermediate layer contacts at least a portion of both side surfaces of the auxiliary electrode.

19. The display device of claim 16, wherein, with respect to a plane parallel to an upper surface of the substrate, a cross-sectional area of the auxiliary electrode at an upper surface thereof is larger than or equal to a cross-sectional area of the auxiliary electrode at the lower surface thereof.

20. The display device of claim 16, wherein the auxiliary electrode has an upper surface larger than or equal to a lower surface of the auxiliary electrode.