ORGANIC LIGHT EMITTING DISPLAY DEVICES

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application claims priority under 35 U.S.C. §119 to Korean patent Application No. 10-2014-0083590, filed on Jul. 4, 2014, the disclosure of which is hereby incorporated by reference herein in its entirety.

BACKGROUND

1. Technical Field

Exemplary embodiments of the inventive concept relate to organic light emitting display devices. More particularly, exemplary embodiments of the inventive concept relate to organic light emitting display devices including capacitors disposed on transparent regions, and method of manufacturing the organic light emitting display devices.

2. Description of the Related Art

An organic light emitting display (OLED) device may display various information such as images or characters by combining electrons provided from a cathode with holes provided from anode in an organic light emitting layer. The organic light emitting display device has been expected as one of promising next generation display devices because the organic light emitting display device has some advantages, for example, a wide view angle, a rapid response speed, a thin thickness, a low power consumption, etc.

Recently, a transparent organic light emitting display device has been rapidly developed. In the transparent organic light emitting display device, an image of an object in the front or the back of a transparent region of the organic light emitting display device may be recognized when the organic light emitting display device is in an "ON" state. In an "OFF" state of the organic light emitting display device, an image may be displayed in a pixel region of the organic light emitting display device using light generated from an organic light emitting layer.

Generally, the transparent organic light emitting display device includes a substrate having a pixel region in which pixels are arranged and a transparent region adjacent to the pixel region, semiconductor devices disposed in the pixel region, a capacitor disposed in the pixel region, peripheral circuits, etc. In the conventional transparent organic light emitting display device, the semiconductor devices and the capacitor are positioned in the pixel region. Here, the capacitor may not have enough area to provide a sufficient capacitance for other elements of the organic light emitting display device.

SUMMARY

Exemplary embodiments provide an organic light emitting display device including a capacitor of a sufficient capacitance disposed in a transparent region without reducing a transmittance of the organic light emitting display device.

According to aspects of the inventive concept, there is provided an organic light emitting display device having a pixel region and a transparent region. The organic light emitting display device may include a substrate, at least one semiconductor device disposed on the substrate in the pixel region, an organic light emitting structure disposed on the at least one semiconductor device, and a capacitor disposed on the substrate in the transparent region.

In exemplary embodiments, the at least one semiconductor device may include a first semiconductor device. The first semiconductor device may include a first active pattern disposed on the substrate, a first gate insulation layer disposed on the first active pattern, a first gate electrode disposed on the first gate insulation layer, a first source electrode contacting a first portion of the first active pattern and having an extended portion extending into the transparent region, and a first drain electrode contacting a second portion of the first active pattern. Further, the capacitor may include a lower electrode contacting the extended portion of the first source electrode, a dielectric structure disposed on the lower electrode, and an upper electrode disposed on the dielectric structure. For example, each of the lower electrode and the upper electrode may include a material having a transmittance or a material having a reflectivity.

In exemplary embodiments, the lower electrode and the first gate electrode are disposed on a same plane and formed of a same material. Additionally, the dielectric structure may include a first insulating interlayer disposed on the first gate electrode and the lower electrode, and a second insulating interlayer disposed on the first insulating interlayer.

In exemplary embodiments, the organic light emitting display device may additionally include an insulation layer disposed on the capacitor and the at least one semiconductor device. Here, the organic light emitting structure may be positioned on the insulation layer.

In exemplary embodiments, the insulation layer may have an opening exposing the dielectric structure in the transparent region, and a contact hole exposing the extended portion of the first source electrode in the pixel region. The upper electrode may be disposed on the dielectric structure exposed by the opening, the insulation layer and a sidewall of the opening. Further, the organic light emitting structure may include a first electrode contacting the exposed portion of the first source electrode through the contact hole, an organic light emitting layer disposed on the first electrode, and a second electrode disposed on the organic light emitting layer. **11**. Alternatively, the upper electrode may be integrally formed with the first electrode. **12**.

In some exemplary embodiments, the insulation layer may have an opening exposing the exposed portion of the first source electrode and the dielectric structure. The upper electrode may be positioned on the insulation layer, one sidewall of the opening and the dielectric structure exposed by the opening. Further, the organic light emitting structure may include a first electrode disposed on the insulation layer, another sidewall of the opening and the exposed portion of the first source electrode, an organic light emitting layer disposed on the first electrode, and a second electrode disposed on the organic light emitting layer.

In exemplary embodiments, the at least one semiconductor device may include a second semiconductor device. The second semiconductor device may include a second active pattern disposed on the substrate, the first gate insulation layer disposed on the second active pattern, a second gate electrode disposed in the first gate insulation layer, a second source electrode contacting a first portion of the second active pattern, and a second drain electrode contacting a second portion of the second active pattern. The second gate electrode and the lower electrode may be positioned respectively at different levels over the substrate.

In exemplary embodiments, the organic light emitting display device may additionally include an additional capacitor disposed in the pixel region. For example, the additional capacitor may be disposed on the first semiconductor device. The additional capacitor may include a lower