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(54) **OLED DISPLAY DEVICE**

(71) Applicant: **Wuhan China Star Optoelectronics Semiconductor Display Technology Co., Ltd.**, Wuhan (CN)

(72) Inventors: **Jiangjiang JIN**, Wuhan (CN); **Hsianglun HSU**, Wuhan (CN)

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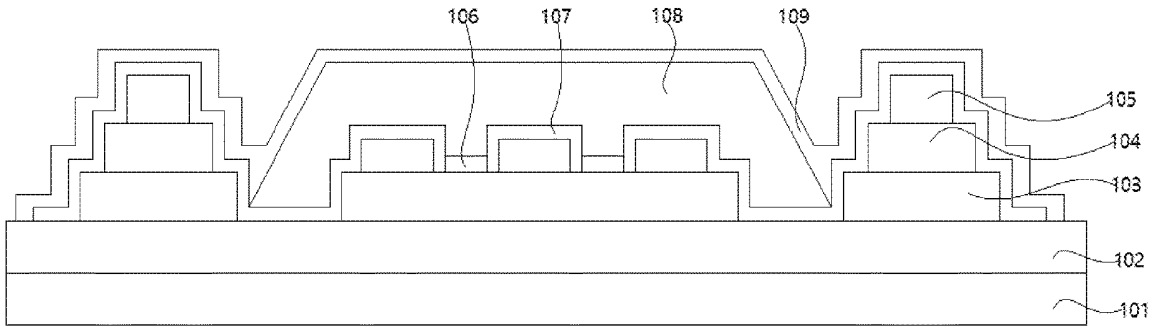
CPC ***H01L 51/5253*** (2013.01)

(57) **ABSTRACT**

The present invention provides an OLED display device, comprising: an OLED display panel, the OLED display panel comprising a display area and non-display areas in the both-ends edges of the display area; a dam unit and a film packaging layer. A part of the film packaging layer corresponding to the display area is disposed on the surface of the OLED display panel; another part of the film packaging layer corresponding to the non-display area is disposed on the surface of the dam unit; wherein, the dam unit comprises a flattening layer, a pixel isolation layer and a pixel support layer stacked-up together.



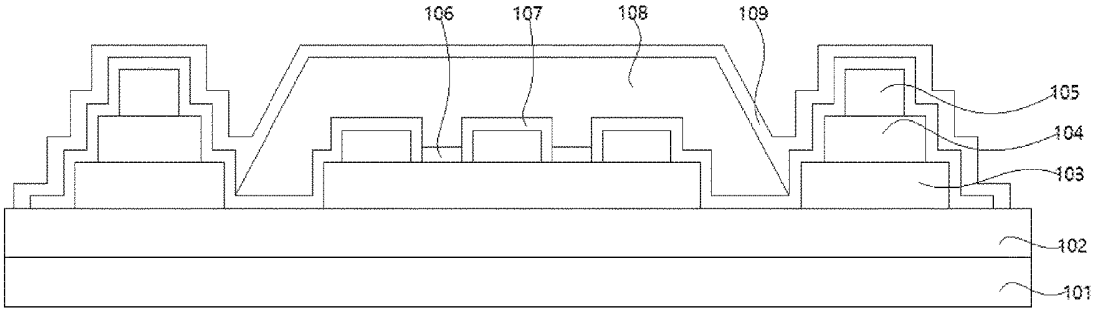


FIG 1

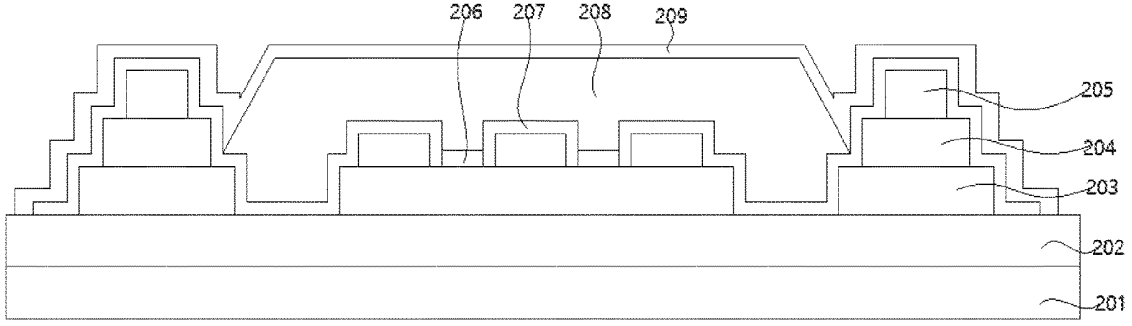


FIG 2

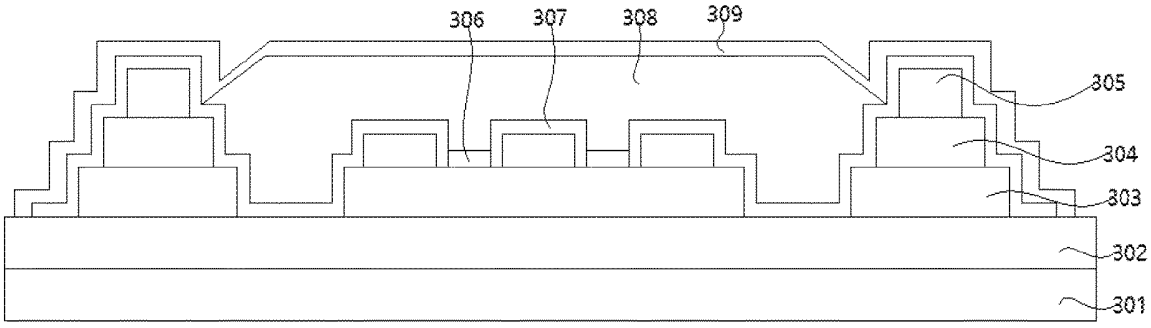


FIG 3

OLED DISPLAY DEVICE

FIELD OF THE INVENTION

[0001] The present invention relates to display technology field, and more particularly to an OLED display device.

DESCRIPTION OF THE PRIOR ART

[0002] At present, the core illuminating element of OLED is electroluminescent device made of multi-layer organic small molecule/polymer, which is different from LCD/LED adopted with inorganic materials. As we know, organic materials are easy to be eroded by outside water and oxygen which brings about cracking and affects lifetime of OLED so the packaging technology plays an important role while the process and requirements of flexible OLED packaging are more complicated. At present, the flexible packaging structure is made of inorganic/organic alternative structure. The inorganic layer is mainly used to cut off water and oxygen while organic layer is used to buffer stress and fill some pinholes in inorganic layer to enhance the channel cutting off water and oxygen and function of covering particulate pollutant. The current OLED display device comprises a plurality of dam walls on the edge of organic packaging layer and inorganic packaging layer and the width of each dam wall is different. To some extent, the structure can avoid lateral erosion of outside water and oxygen but it may cause materials of organic packaging overflow due to machine error and difference between substrates etc. in organic coating process.

[0003] Based on the above, current OLED display device may cause materials of organic packaging overflow due to machine error and difference between substrates etc. in organic coating process and then further cause to lateral erosion of outside water and oxygen to OLED display device.

BRIEF SUMMARY OF THE INVENTION

[0004] Current OLED display device may cause materials of organic packaging overflow due to machine error and difference between substrates etc. in organic coating process and then further cause to lateral erosion of outside water and oxygen to OLED display device.

[0005] The present invention provides an OLED display device, comprising: an OLED display panel, a dam unit of non-display area in the both-ends edges of the display area and a film packaging layer; the OLED display panel comprising a display area and non-display areas in the both-ends edges of the display area; a part of the film packaging layer corresponding to the display area being disposed on the surface of the OLED display panel; another part of the film packaging layer corresponding to the non-display area being disposed on the surface of the dam unit;

[0006] Wherein, the dam unit comprises a flattening layer, a pixel isolation layer and a pixel support layer stacked-up together. The width of the pixel support layer is 10-50 micrometers; the width of the pixel isolation layer is larger than that of the pixel support layer; the width of the flattening layer is larger than that of the pixel isolation layer.

[0007] In the OLED display device of the present invention, a part of the film packaging layer in the display area comprises a first inorganic packaging layer, an organic packaging layer and a second inorganic packaging layer stacked-up together.

[0008] In the OLED display device of the present invention, another part of the film packaging layer in the non-display area comprises the first inorganic packaging layer and the second inorganic layer; the first inorganic packaging layer and the second inorganic packaging layer cover the dam unit completely.

[0009] In the OLED display device of the present invention, the height of an edge of the organic packaging layer is lower than that of the flattening layer.

[0010] In the OLED display device of the present invention, the height of the edge of the organic packaging layer is higher than that of the flattening layer and lower than the sum height of the flattening layer and the pixel isolation layer.

[0011] In the OLED display device of the present invention, the height of the edge of the organic packaging layer is higher than the sum height of the flattening layer and the pixel isolation layer and lower than the sum height of the flattening layer, the pixel isolation layer and the pixel support layer.

[0012] In the OLED display device of the present invention, the materials of the first inorganic packaging layer are one or more combination of silicon nitride, silicon dioxide, aluminum oxide, titanium dioxide and zirconium dioxide; the thickness of the first inorganic packaging layer is 0.5-1.5 micrometers.

[0013] In the OLED display device of the present invention, the materials of organic packaging layer are acrylic, epikote or organosilicone; the thickness of the organic packaging layer is 4-20 micrometers.

[0014] In the OLED display device of the present invention, the material of the second inorganic packaging layer and the material of the first inorganic packaging layer are same; the thickness of the second inorganic packaging layer and the first inorganic packaging layer is the same.

[0015] An OLED display device comprises an OLED display panel, a dam unit of non-display area in the both-ends edges of the display area and a film packaging layer; the OLED display panel comprises a display area and non-display areas in the both-ends edges of the display area; a part of the film packaging layer corresponding to the display area is disposed on the surface of the OLED display panel; another part of the film packaging layer corresponding to the non-display area is disposed on the surface of the dam unit;

wherein, the dam unit is provided with a flattening layer, a pixel isolation layer and a pixel support layer stacked-up together.

[0016] In the OLED display device of the present invention, the part of the film packaging layer in the display area comprises a first inorganic packaging layer, an organic packaging layer and a second inorganic packaging layer stacked-up together.

[0017] In the OLED display device of the present invention, the part of the film packaging layer in the non-display area comprises the first inorganic packaging layer and the second inorganic layer; the first inorganic packaging layer and the second inorganic packaging layer cover the dam unit completely.

[0018] In the OLED display device of the present invention, the height of an edge of the organic packaging layer is lower than that of the flattening layer.

[0019] In the OLED display device of the present invention, the height of the edge of the organic packaging layer is

higher than that of the flattening layer and lower than the sum height of the flattening layer and the pixel isolation layer.

[0020] In the OLED display device of the present invention, the height of the edge of the organic packaging layer is higher than the sum height of the flattening layer and the pixel isolation layer and lower than the sum height of the flattening layer, the pixel isolation layer and the pixel support layer.

[0021] In the OLED display device of the present invention, the materials of the first inorganic packaging layer are one or more combination of silicon nitride, silicon dioxide, aluminum oxide, titanium dioxide and zirconium dioxide; the thickness of the first inorganic packaging layer is 0.5-1.5 micrometers.

[0022] In the OLED display device of the present invention, the materials of organic packaging layer are acrylic, epikote or organosilicone; the thickness of the organic packaging layer is 4-20 micrometers.

[0023] In the OLED display device of the present invention, the material of the second inorganic packaging layer and material of the first inorganic packaging layer are same; the thickness of the second inorganic packaging layer and the thickness of the first inorganic packaging layer are same.

[0024] The beneficial effect of the present invention is: The OLED display device uses the dam unit comprising the flattening layer, the pixel isolation layer and the pixel support layer stacked-up together to further prevent lateral erosion of outside water and oxygen to OLED display device so will be more beneficial to make the narrow-bezel display of OLED display device come true.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] For more clearly understanding above content of the present invention, the following text will briefly introduce the accompanying drawings used in the preferred embodiment of the present invention. It is obvious that the accompanying drawings in the following description are only some embodiments of the present invention. For the technical personnel of the field, other drawings can also be obtained from these drawings without paying creative work.

[0026] FIG. **1** is a structure schematic view of Plan 1 for an OLED display device of the present invention.

[0027] FIG. **2** is a structure schematic view of Plan 2 for an OLED display device of the present invention.

[0028] FIG. **3** is a structure schematic view of Plan 3 for an OLED display device of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0029] The embodiments are shown in the accompanying drawings, in which the same or similar signs represent the same or similar elements or elements with the same or similar functions from beginning to end. The directions shown in the present invention, e.g. up, down, front, back, left, right, inside, outside, side face etc., are only illustrative directions of the accompanying drawings and are intended only to explain the present invention and are not understood as limitations to the invention. In the accompanying drawings, the units with similar structures are presented with same mark.

[0030] The present invention aims to solve the technical problem that current OLED display device may cause materials of organic packaging overflow due to machine error and difference between substrates etc. in organic coating process and then further cause to lateral erosion of outside water and oxygen to OLED display device.

[0031] The present invention provides an OLED display device, comprises:

an OLED display panel, the OLED display panel comprising a display area and non-display areas in the both-ends edges of the display area;

a dam unit, the dam unit in the non-display area of the both-ends edges of the display area;

a film packaging layer, a part of the film packaging layer corresponding to the display area being disposed on the surface of the OLED display panel; another part of the film packaging layer corresponding to the non-display area being disposed on the surface of the dam unit;

wherein, the dam unit is provided with a flattening layer, a pixel isolation layer and a pixel support layer stacked-up together.

[0032] FIG. **1** is a structure schematic view of Plan 1 for an OLED display device of the present invention; the detailed production process is as follows.

[0033] First, providing a flexible substrate **101**, the materials of the flexible substrate **101** can be polyvinyl alcohol, polyimide, polyester and so on. Make the TFT driver layer **102** on the surface of the flexible substrate **101**. The main function of the TFT driver layer **102** is to supply electricity to drive OLED materials giving out light. Then depose the dam unit on the non-display area in the both-ends edges of the display area. The dam unit comprises a flattening layer **103**, a pixel isolation layer **104** and a pixel support layer **105** stacked-up together; the width of the pixel support layer **105** is 10-50 micrometers, preferably is 20 micrometers; the width of the pixel isolation layer **104** is larger than that of the pixel support layer **105**, preferably is 30 micrometers; the width of the flattening layer **103** is larger than that of the pixel isolation layer **104**. The preferable width of the flattening layer **103** is 40 micrometers.

[0034] Second, dispose the luminous layer **106** in the display area of the OLED display device and dispose the film packaging layer on the surface of the OLED display device. A part of the film packaging layer corresponding to the display area is disposed on the surface of the OLED display panel. Another part of the film packaging layer corresponding to the non-display area is disposed on the surface of the dam unit. The part of the film packaging layer in the display area comprises the first inorganic packaging layer **107**, the organic packaging layer **108**, the second inorganic packaging layer **109** stacked-up together; the part of the film packaging layer in the non-display area comprises the first inorganic packaging layer **107** and the second inorganic layer **109**; the first inorganic packaging layer **107** and the second inorganic packaging layer **109** cover the dam unit completely.

[0035] The materials of the first inorganic packaging layer **107** are one or more combination of silicon nitride, silicon dioxide, aluminum oxide, titanium dioxide and zirconium dioxide, preferably is silicon nitride; the thickness of the first inorganic packaging layer **107** is 0.5-1.5 micrometers, preferably is 1 micrometer.

[0036] The materials of organic packaging layer **108** are acrylic, epikote or organosilicone, preferably is epikote; the thickness of the organic packaging layer **108** is 4-20 micrometers, preferably is 10 micrometers; the height of

edges of the organic packaging layer **108** is lower than or equal to that of the flattening layer **103**.

[0037] The material of the second inorganic packaging layer **109** and the material of the first inorganic packaging layer **107** are same, preferably is silicon nitride; the thickness of the second inorganic packaging layer **109** and the thickness of the first inorganic packaging layer **107** are same, preferably is 1 micrometer.

[0038] The OLED display device with Plan 1 disposes the dam unit with the flattening layer, the pixel isolation layer and the pixel support layer stacked-up together and makes the height of both-ends edges of the organic packaging layer is lower than or equal to that of the flattening layer to further prevent lateral erosion of outside water and oxygen to OLED display device so will be more beneficial to make the narrow-bezel display of OLED display device come true.

[0039] FIG. **2** is a structure schematic view of Plan **2** for an OLED display device of the present invention; the detailed production process is as follows.

[0040] First, providing a flexible substrate **201**, the materials of the flexible substrate **201** can be polyvinyl alcohol, polyimide, polyester and so on. Make the TFT driver layer **202** on the surface of the flexible substrate **201**. The main function of the TFT driver layer **202** is to supply electricity to drive OLED materials giving out light. Then depose the dam unit on the non-display area in the both-ends edges of the display area. The dam unit is provided with a flattening layer **203**, a pixel isolation layer **204** and a pixel support layer **205** stacked-up together; the width of the pixel support layer **205** is 10-50 micrometers, preferably is 20 micrometers; the width of the pixel isolation layer **204** is larger than that of the pixel support layer **205**, preferably is 30 micrometers; the width of the flattening layer **203** is larger than that of the pixel isolation layer **204**. The preferable width of the flattening layer **203** is 40 micrometers.

[0041] Second, dispose the luminous layer **206** in the display area of the OLED display device and dispose the film packaging layer on the surface of the OLED display device. A part of the film packaging layer corresponding to the display area is disposed on the surface of the OLED display panel. Another part of the film packaging layer corresponding to the non-display area is disposed on the surface of the dam unit. The part of the film packaging layer in the display area is provided with the first inorganic packaging layer **207**, the organic packaging layer **208** and the second inorganic packaging layer **209** stacked-up together; the part of the film packaging layer in the non-display area is provided with the first inorganic packaging layer **207** and the second inorganic layer **209**; the first inorganic packaging layer **207** and the second inorganic packaging layer **209** cover the dam unit completely.

[0042] The materials of the first inorganic packaging layer **207** are one or more combination of silicon nitride, silicon dioxide, aluminum oxide, titanium dioxide and zirconium dioxide, preferably is silicon nitride; the thickness of the first inorganic packaging layer **207** is 0.5-1.5 micrometers, preferably is 1 micrometer.

[0043] The materials of organic packaging layer **208** are acrylic, epikote or organosilicone, preferably is epikote; the thickness of the organic packaging layer **208** is 4-20 micrometers, preferably is 10 micrometers; the height of edges of the organic packaging layer **208** is higher than that of the flattening layer **203** and lower than the sum height of the flattening layer **203** and the pixel isolation layer **204**.

[0044] The material of the second inorganic packaging layer **209** and the material of the first inorganic packaging layer **207** is same, preferably is silicon nitride; the thickness of the second inorganic packaging layer **209** and the thickness the first inorganic packaging layer **207** is same, preferably is 1 micrometer.

[0045] The OLED display device with Plan 2 disposes the dam unit with flattening layer, pixel isolation layer and pixel support layer stacked-up together and makes the height of both-ends edges of the organic packaging layer is higher than that of the flattening layer and lower than the sum height of the flattening layer and the pixel isolation layer to further prevent lateral erosion of outside water and oxygen to OLED display device so will be more beneficial to make the narrow-bezel display of OLED display device come true.

[0046] FIG. **3** is a structure schematic view of Plan 3 for an OLED display device of the present invention; the detailed production process is as follows.

[0047] First, providing a flexible substrate **301**, the materials of the flexible substrate **301** can be polyvinyl alcohol, polyimide, polyester and so on. Make the TFT driver layer **302** on the surface of the flexible substrate **301**. The main function of the TFT driver layer **302** is to supply electricity to drive OLED materials giving out light. Then depose the dam unit on the non-display area in the both-ends edges of the display area. The dam unit is provided with a flattening layer **303**, a pixel isolation layer **304** and a pixel support layer **305** stacked-up together; the width of the pixel support layer **305** is 10-50 micrometers, preferably is 20 micrometers; the width of the pixel isolation layer **304** is larger than that of the pixel support layer **305**, preferably is 30 micrometers; the width of the flattening layer **303** is larger than that of the pixel isolation layer **304**. The preferable width of the flattening layer **303** is 40 micrometers.

[0048] Second, dispose the luminous layer **306** in the display area of the OLED display device and dispose the film packaging layer on the surface of the OLED display device. A part of the film packaging layer corresponding to the display area is disposed on the surface of the OLED display panel. Another part of the film packaging layer corresponding to the non-display area is disposed on the surface of the dam unit. The part of the film packaging layer in the display area comprises a first inorganic packaging layer **307**, the organic packaging layer **308** and the second inorganic packaging layer **309** stacked-up together; the part of the film packaging layer in the non-display area comprises the first inorganic packaging layer **307** and the second inorganic layer **309**; the first inorganic packaging layer **307** and the second inorganic packaging layer **309** cover the dam unit completely.

[0049] The materials of the first inorganic packaging layer **307** are one or more combination of silicon nitride, silicon dioxide, aluminum oxide, titanium dioxide and zirconium dioxide, preferably is silicon nitride; the thickness of the first inorganic packaging layer **307** is 0.5-1.5 micrometers, preferably is 1 micrometer.

[0050] The materials of organic packaging layer **308** are acrylic, epikote or organosilicon, preferably is epikote; the thickness of the organic packaging layer **308** is 4-20 micrometers, preferably is 10 micrometers; the height of edges of the organic packaging layer **308** is higher than the sum height of the flattening layer **303** and the pixel isolation

layer **304** and lower than the sum height of the flattening layer **303**, the pixel isolation layer **304** and the pixel support layer **305**.

[0051] The material of the second inorganic packaging layer **309** and the material of the first inorganic packaging layer **307** are same, preferably is silicon nitride; the thickness of the second inorganic packaging layer **309** and the thickness of the first inorganic packaging layer **307** are same, preferably is 1 micrometer.

[0052] The OLED display device with Plan 3 disposes the dam unit with the flattening layer, the pixel isolation layer and the pixel support layer stacked-up together and makes the height of both-ends edges of the organic packaging layer is higher than the sum height of the flattening layer and the pixel isolation layer and lower than the sum height of the flattening layer, the pixel isolation layer and the pixel support layer to further prevent lateral erosion of outside water and oxygen to OLED display device so will be more beneficial to make the narrow-bezel display of OLED display device come true.

[0053] The beneficial effect of the present invention is: The OLED display device uses the dam unit consisting of the flattening layer, the pixel isolation layer and the pixel support layer to further prevent lateral erosion of outside water and oxygen to OLED display device so will be more beneficial to make the narrow-bezel display of OLED display device come true.

[0054] In above text, the principles and implementation mode of the present invention are expounded with specific examples but not to limit the invention. Moreover, for those of ordinary skill in the art, there will be changes in the specific implementation and application scope according to the ideas of the present invention. Therefore, the scope of protection for the invention shall be subject to the scope defined by the claims.

What is claimed is:

1. An OLED display device, which comprises:

an OLED display panel, comprising a display area and non-display areas in the both-ends edges of the display area;

a dam unit, being disposed in non-display area in the both-ends edges of the display area;

a film packaging layer, one part of the film packaging layer corresponding to the display area being disposed on the surface of the OLED display panel; another part of the film packaging layer corresponding to the non-display area being disposed on the surface of the dam unit;

wherein the dam unit comprises a flattening layer, a pixel isolation layer and a pixel support layer stacked-up together; the width of the pixel support layer is 10-50 micrometers, the width of the pixel isolation layer is larger than that of the pixel support layer, the width of the flattening layer is larger than that of the pixel isolation layer.

2. The OLED display device as claimed in claim **1**, wherein the part of the film packaging layer in the display area comprises a first inorganic packaging layer, an organic packaging layer and a second inorganic packaging layer stacked-up together.

3. The OLED display device as claimed in claim **2**, wherein the part of the film packaging layer in the non-display area comprises the first inorganic packaging layer and the second inorganic layer; the first inorganic packaging layer and the second inorganic packaging layer cover the dam unit completely.

4. The OLED display device as claimed in claim **2**, wherein the height of an edge of the organic packaging layer is lower than that of the flattening layer.

5. The OLED display device as claimed in claim **2**, wherein the height of the edge of the organic packaging layer is higher than that of the flattening layer and lower than the sum height of the flattening layer and the pixel isolation layer.

6. The OLED display device as claimed in claim **2**, wherein the height of the edge of the organic packaging layer is higher than the sum height of the flattening layer and the pixel isolation layer and lower than the sum height of the flattening layer, the pixel isolation layer and the pixel support layer.

7. The OLED display device as claimed in claim **2**, wherein the materials of the first inorganic packaging layer are one or more combination of silicon nitride, silicon dioxide, aluminum oxide, titanium dioxide and zirconium dioxide; the thickness of the first inorganic packaging layer is 0.5-1.5 micrometers.

8. The OLED display device as claimed in claim **2**, wherein materials of organic packaging layer are acrylic, epikote or organosilicone; the thickness of the organic packaging layer is 4-20 micrometers.

9. The OLED display device as claimed in claim **2**, wherein the material of the second inorganic packaging layer and the material of the first inorganic packaging layer are same; the thickness of the second inorganic packaging layer and the thickness of the first inorganic packaging layer are same.

10. An OLED display device, wherein comprises:

an OLED display panel, comprising a display area and non-display areas in the both-ends edges of the display area;

a dam unit, being disposed in non-display area in the both-ends edges of the display area;

a film packaging layer, one part of the film packaging layer corresponding to the display area being disposed on the surface of the OLED display panel; another part of the film packaging layer corresponding to the non-display area being disposed on the surface of the dam unit;

wherein the dam unit comprises a flattening layer, a pixel isolation layer and a pixel support layer stacked-up together.

11. The OLED display device as claimed in claim **10**, wherein the part of the film packaging layer in the display area comprises a first inorganic packaging layer, an organic packaging layer and a second inorganic packaging layer stacked-up together.

12. The OLED display device as claimed in claim **11**, wherein the part of the film packaging layer in the non-display area comprises the first inorganic packaging layer and the second inorganic layer; the first inorganic packaging layer and the second inorganic packaging layer cover the dam unit completely.

13. The OLED display device as claimed in claim **11**, wherein the height of an edge of the organic packaging layer is lower than that of the flattening layer.

14. The OLED display device as claimed in claim **11**, wherein the height of the edge of the organic packaging

layer is higher than that of the flattening layer and lower than the sum height of the flattening layer and the pixel isolation layer.

15. The OLED display device as claimed in claim **11**, wherein the height of the edge of the organic packaging layer is higher than the sum height of the flattening layer and the pixel isolation layer and lower than the sum height of the flattening layer, the pixel isolation layer and the pixel support layer.

16. The OLED display device as claimed in claim **11**, wherein the materials of the first inorganic packaging layer are one or more combination of silicon nitride, silicon dioxide, aluminum oxide, titanium dioxide and zirconium dioxide; the thickness of the first inorganic packaging layer is 0.5-1.5 micrometers.

17. The OLED display device as claimed in claim **11**, wherein the materials of organic packaging layer are acrylic, epikote or organosilicone; the thickness of the organic packaging layer is 4-20 micrometers.

18. The OLED display device as claimed in claim **11**, wherein the material of the second inorganic packaging layer and the material of the first inorganic packaging layer are the same; the thickness of the second inorganic packaging layer and the thickness of the first inorganic packaging layer are same.

* * * * *

专利名称(译)	OLED显示装置		
公开(公告)号	US20200067015A1	公开(公告)日	2020-02-27
申请号	US16/308467	申请日	2018-08-23
[标]发明人	JIN JIANGJIANG HSU HSIANGLUN		
发明人	JIN, JIANGJIANG HSU, HSIANGLUN		
IPC分类号	H01L51/52		
CPC分类号	H01L51/5253 H01L51/5237 H01L27/3246 H01L51/5246 H01L2251/5338		
外部链接	Espacenet USPTO		

摘要(译)

本发明提供一种OLED显示装置，包括：OLED显示面板，该OLED显示面板包括显示区域和在该显示区域的两端边缘中的非显示区域。 坝单元和薄膜包装层。 薄膜包装层的与显示区域相对应的一部分设置在OLED显示面板的表面上； 薄膜包装层的与非显示区域相对应的另一部分设置在挡板单元的表面上。 其中，所述坝单元包括堆叠在一起的平坦层，像素隔离层和像素支撑层。