herein a layer need not be planar, but can be bent, folded or otherwise contoured, for example, to at least partially envelop another component. As used herein a layer can also include multiple sub-layers. A layer can also consist of a collection of discrete portions, for example, a layer of discrete active regions comprising individual pixels.

FIG. 1 shows a light-emitting device comprising an organic light-emitting diode structure 10. The light emitting diode structure 10 is encapsulated by a first and a second barrier structure 20, 30. The light emitting diode structure for example subsequently comprises the following layers an anode formed by an indium tin oxide (ITO) layer having a thickness of about 120 nm, a PEDOT layer having a thickness of about 100 nm, a light emitting polymer layer (LEP) having a thickness of 80 nm and a cathode layer having a barium sub-layer (5nm) and an aluminium sub-layer (100nm). The first barrier structure 20 comprises a first inorganic layer 21, an organic layer 22 and a second inorganic layer 23. The second barrier structure 30 comprises a first inorganic layer 31, an organic layer 32 and a second inorganic layer 33. The light-emitting device is mounted via a first and a second intermediate layer 21, 51 at a substrate 50. If desired the substrate may be removed. The second barrier structure 30 with first inorganic layer 31, organic layer 32 and second inorganic layer 33 of the encapsulation 20, 30 forms a light-transmitting window. The organic layer 32 of the second barrier structure is composed of a dispersion of at least two mutually immiscible organic substances. In an embodiment one of said first and said second organic component of the organic layer comprises a polymerized substance A selected from (meth)acrylates, epoxys, oxetanes, and wherein the other one of said first and said second organic component of the organic layer comprises a polymerized substance B selected from silicon (meth)acrylates, silicon epoxies, fluorinated (meth)acrylates, fluorinated epoxies, preferentially silicon epoxies. In this example the inorganic layers 31, 33 have a thickness of 150 nm and are formed of SiN. The organic layer 32 has a thickness of 100 μm.

FIG. 2 shows a SEM picture corresponding to a cross-section through the organic layer 32 according to II-II in FIG. 1.

In the embodiment shown the dispersion comprises a mixture of two epoxy silicon resins (90.5 w%) and a cycloaliphatic epoxy resin (7.5 w%). In addition the dispersion comprises 2 w% of photo-initiator. In this composition the two silicon epoxy resins are miscible (they give a clear solution and film), the epoxy resin 1 is not miscible with the cycloaliphatic epoxy (gives a white solution and film) and the epoxy silicon 2 is miscible with the cycloaliphatic epoxy resin (gives a clear solution and film). Suitable materials to produce the organic layer 32 can be found for example in the European patent application 10161452.7.

The transparent organic substances in the organic layer forms micrometer-sized phase-separating domains that have a mutually different refractive index, so that light is refracted at the interfaces between these phase separating domains.
As also shown schematically in FIG. 2A, the first and second organic substances form a sea-island structure having an island phase 32a (dark-gray in the picture) and a sea phase 32b (light-grey in the picture).

FIG. 3 shows an AFM-picture of the organic layer 32. In this picture only the island phase 32a is shown. From this picture it becomes clear that the island phase 32a is shaped as lens like elements.

In an embodiment, the lens-like elements 32a substantially have a diameter in the range of 0.5 to 20 μm, preferentially 1 to 10 μm.

A surface analysis was carried out to determine the composition of the phases in the organic layer. FIG. 3A illustrates the distribution of Si at the surface of the layer. Therein relatively bright zones having a relatively high Si content and relatively dark zones have a relatively low Si content.

A more detailed measurement indicated in mass percent the following distribution of the elements C, O and Si for the island phase (ID1) and the sea-phase (ID2), as shown in the following table.

Table 1: distribution of the elements C, O and Si in the phases of the organic layer.

Spectrum	C	O	Si
ID1	54.33	29.51	16.15
ID2	37.38	35.25	27.36

From the table it can be concluded that the sea-phase is relatively Si-rich in comparison to the island phase.

The improvement of a light-output of the light-emitting device provided with an organic layer comprising a dispersion of mutually immiscible transparent organic substances was compared with that of a same light-emitting device without such a layer. The light-output was also compared with that of a light-emitting device having a commercially available light-outcoupling foil provided with micro-lenses.

A hybrid white OLED at colour point A (Warm White) with a very good uniformity was used for the tests. The optical output of the white OLED (O) was measured on a special mount in an integrating sphere ISB 500 from Instrument

CLAIMS

1. A light-emitting device comprising

- an organic light-emitting diode structure ~~(10)~~,

- an encapsulation ~~(20, 30)~~ comprising a light-transmitting window ~~(30)~~ with at least a first inorganic layer ~~(31)~~, an organic layer ~~(32)~~ and a second inorganic layer ~~(33)~~, the organic layer ~~(32)~~ comprising domains of a dispersed first organic component ~~(32a)~~ embedded by a second organic component ~~(32b)~~, the first organic component and the second organic component having a mutually different refractive index, the organic layer ~~(32)~~ being sandwiched between the first and the second inorganic layer ~~(31, 33)~~, the organic layer being applied at the first inorganic layer and the second inorganic layer being applied at the organic layer.

2. A light-emitting device according to claim 1, wherein the domains ~~(32a)~~ forms lens-like elements.

3. A light-emitting device according to claim 2, wherein the lens-like elements ~~(32a)~~ substantially have a diameter in the range of 0.5 to 20 μm, preferentially 1 to 10 μm.

4. A light-emitting device according to claim 1, wherein the organic layer ~~(32)~~ has a thickness between 5 and 100 μm.

5. A light-emitting device according to claim 1, wherein the inorganic layers ~~(31, 33)~~ have a thickness in the range of 10 to 1000 nm.

6. A light-emitting device according to claim 5, wherein the inorganic layers ~~(31, 33)~~ have a thickness in the range of 100 to 300 nm.

7. A light-emitting device, according to claim 1, wherein one of said first and said second organic component of the organic layer comprises ~~the following organic substances:~~

~~–~~a polymerized substance A selected from (meth)acrylates, epoxys, oxetanes, and wherein the other one of said first and said second organic component of the organic layer comprises

- a polymerized substance B selected from silicon (meth)acrylates, silicon epoxies, fluorinated (meth)acrylates, fluorinated epoxies, preferentially silicon epoxies.

8. A method for manufacturing a light-emitting device, comprising the steps of
- providing ~~(S7)~~ a light-emitting structure,
- providing an encapsulation comprising the step of providing a light-transmitting window by
  - providing ~~(S8)~~ at least a first inorganic layer,
  - providing ~~(S9)~~ an organic layer at the first inorganic layer, the organic layer being composed of at least a first and a second organic component having a mutually different refractive index, wherein the at least first component is dispersed as domains that are embedded by the at least second component in the composite organic layer,
  - curing ~~(S10)~~ the organic layer and
  - providing ~~(S11)~~ a second inorganic layer at the organic layer.

9. A method according to claim 8, wherein the step ~~(S9)~~ of providing an organic layer comprises preparing a dispersion of at least first liquid organic substance into at least a second liquid organic substance, which liquid organic substances are mutually immiscible and applying the dispersion at the at least a first inorganic layer.

10. A method according to claim 8, wherein the step of curing ~~(S10)~~ the organic layer causes a phase separation resulting in formation of the domains of the first component embedded by the second component.