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(54) **LIGHT-EMITTING DEVICE WITH INORGANIC HOUSING**

LEUCHTDIODE MIT GEHÄUSE AUS ANORGANISCHEM MATERIAL

DISPOSITIF ELECTROLUMINESCENT COMPRENANT UN BOITIER INORGANIQUE

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Description

TECHNICAL FIELD

[0001] The present invention relates to a light-emitting device comprising a light-emitting diode, which emits light, and a housing arranged to receive at least a portion of said light. The invention also relates to methods for the manufacture of such light-emitting devices.

TECHNICAL BACKGROUND

[0002] Semiconductor light-emitting devices, such as light-emitting diodes (LEDs) and laser diodes (LDs), are among the most efficient and robust light sources currently available.

[0003] Light extraction is a key issue for light emitting devices. A common problem with semiconductor light-emitting devices is that the efficiency with which light may be extracted from the device is reduced due to internal reflection in the interface between the device and the surroundings, followed by reabsorption of the reflected light in the device. The internal reflection is due to that the refractive index of the device materials is higher than the refractive index of the material in which the device is packaged or encapsulated.

[0004] For high efficient light extraction, it is advantageous if the light extracting materials are in direct contact with the light-emitting device. However, in high power applications, where single solid-state light emitting devices with an effect of up to 3 Watts per square mm or arrays of such devices, with a total effect of up to 100 Watts or more, a lot of heat is dissipated from the light emitting devices. Temperatures of up to 250°C are easily reached for such high power application.

[0005] Thus, for high-power applications, a heat resistant encapsulation has to be used. Thus it would be advantageous to use a fully inorganic approach, as inorganic materials may be chosen that have very high temperature resistance.

[0006] JP-2003179270-A describes a semiconductor light emitting element coated directly with a translucent coating material made of polymetaloxane or ceramic and that is heat resistant.

[0007] However, the processing temperature for connecting the coating material and the light emitting element must be low, e.g. lower than 340°C, or otherwise, the n/p-junctions in the light emitting element will be damaged.

[0008] For coatings/encapsulations of ceramic materials, it would be advantageous to be able to use higher temperatures, for example to increase the range of different materials which can be used, and in steps of attaching other components, such as for example lenses, to the encapsulation.

[0009] However, substrates and circuitry on which light-emitting semiconductor devices are arranged are often heat sensitive. Thus, it would be advantageous with a device that allows for high-temperature processing of the encapsulation without damaging the substrate and/or circuitry.

[0010] EP 1 267 420 A2 discloses a light-emitting device, comprising a housing having a recess, the housing comprising a translucent inorganic material, wherein a light emitting diode is positioned in the recess, and a translucent inorganic glass contact layer material is arranged between the light emitting diode and the housing to bond the light emitting diode to the housing in the recess.

[0011] For high-intensity applications, it would also be advantageous to be able to easily arrange several semiconductor light-emitting devices under one and the same encapsulation to, for example, reduce the size of the device and to improve color mixing.

SUMMARY OF THE INVENTION

[0012] One object of the present invention is thus to provide a light-emitting device which overcomes the above-mentioned problems of the prior art. Another object is to provide a method for the manufacture of such a light-emitting device.

[0013] Thus, in a first aspect the present invention relates to a light-emitting device as defined in claim 4.

[0014] The use of an inorganic housing material and an inorganic contact layer allows for the device to be resistant to high temperatures well above 200°C that may occur when the device is operated using high-power LEDs, and at which temperatures organic materials will disintegrate.

[0015] The positioning and orientating means may for example be constituted by the walls of each recess.

[0016] In order to connect the light-emitting diode to a power supply, the light-emitting diode in a device according to the present invention may further comprise a substrate on which a circuitry is arranged, wherein the light-emitting diode is arranged on and connected to the circuitry.

[0017] The device comprises an array of a plurality of light-emitting diodes wherein the LEDs will be arranged in a recess, each being positioned and oriented by the positioning and orientating means in separate positions. The circuitry will then be arranged on and connected to each LED at the position for each LED.

[0018] In a device of the present invention comprising an array of multiple LEDs, each LED may be arranged in a separate recess. This improves, for example, the possibilities for choosing different contact layer materials for different LEDs.

[0019] The inorganic material constituting the housing may be a ceramic material. Ceramic materials are advantageously used as the housing material as they, in addition to being heat resistant, often have essentially the same heat expansion coefficient as light-emitting diodes. Thus, essentially no tension is put on the device due to temperature changes during operation of the device.

[0020] The inorganic housing material may comprise a phosphor compound. Phosphor compounds may be used in the housing material to convert the color of the light received from the light-emitting diode into a desired converted color.

[0021] The translucent inorganic contact layer material may be a glass material.

[0022] Glass materials are preferred to use as they easily can be formed to fill a recess, such as by melting the temperature at which the glass is liquid. Further, heat expansion coefficient is essentially the same as for a ceramic material and for a light-emitting diode.

[0023] The translucent inorganic contact layer may further comprise a luminescent material.

[0024] The luminescent compound in the contact layer can be used to convert the color of light received from the light-emitting diode into light of a desired color.

[0025] In embodiments with a plurality of light-emitting diodes arranged in separate recesses in a housing, different contact layer materials, e.g. comprising different luminescent materials, may be arranged between different LEDs and the housing. Thus, light emitted through the contact layer of separate light-emitting diodes may have different color, even if light-emitting diodes with the same intrinsic color are used.

[0026] In a second aspect, the present invention also relates to a method as defined in claim 1 for the manufacture of a light-emitting device.

[0027] One advantage with the method is that the contact layer can be arranged in the recess at high temperature, preferably at a temperature where the contact layer material is in a liquid state to easily spread in the recess, and to allow a good contact between the contact layer and the housing. Then, the light-emitting diode may also be arranged in the recess and connected to the contact layer at a high temperature to allow good contacting between the contact layer and the light-emitting diode.

[0028] The method of the present invention may further comprise the light-emitting diode to a circuitry, which preferably may be performed after the light-emitting diode is arranged in the housing. This step can be performed at a temperature that is not detrimental to the circuitry, or components associated therewith, such as a substrate on which the circuitry is arranged.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029]

Figure 1 illustrates, in cross-sectional view, a light-emitting device of the present invention.

Figure 2, a-f, outlines a method for the manufacture of a light-emitting device of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0030] The present invention will now be described more in detail with reference to the drawings.

[0031] A preferred embodiment of the present invention, as shown in figure 1, comprises a substrate 1 provided with a circuitry. An array of light-emitting diodes (LEDs) 2 are arranged on the circuitry, and each LED of the array are separately connected to the circuitry by metal bumps 3 at pre-determined positions.

[0032] The LEDs 2 are arranged in separate recesses in a housing 4 of a translucent inorganic material, and the location and the orientation of each LED is determined by the walls of the recess. A translucent inorganic contact layer 5 is arranged between each LED and the housing 4, in the recesses to optically connect and physically bind the LED to the housing.

[0033] Furthermore, a specular reflector 6 is arranged on the substrate 1 to collimate the light emitted by the device.

[0034] A preferred method for the manufacture of a light-emitting device of the present invention is outlined in fig 2, a-f.

[0035] An inorganic translucent housing 4 having a plurality of recesses 7 is provided. (Fig 2a)

[0036] A translucent inorganic contact layer material 5 is arranged in each of the recesses 7, preferably at a temperature at which the contact layer material is liquid, above the softening temperature for the contact layer material, for example in the range from 300°C to 1600°C, depending on the contact layer material, as this improves the contact to the housing (fig 2b).

[0037] Then, a LED 2 is arranged in each recess 7 provided with contact layer material 5, at a temperature between the glass temperature and the softening temperature of the contact layer material, for example in the range from 250°C to 400°C, preferably lower than 350°C (depending on the contact layer material), but in accordance with the invention at a temperature in the range from 250°C to lower than 350°C, to obtain good contact between contact layer material and LED. The thus formed housing-LED assembly is cooled down to a temperature where bonding of the LED to the housing via the contact layer is obtained (fig 2c-d).

[0038] The housing-LED assembly is then arranged on a substrate 1 to bring the connectors of the LEDs in contact with metal bumps 3 arranged on a circuitry 8 arranged on the substrate (fig 2e). The housing-LED assembly and the substrate are thermo-compressed at a temperature high enough to effect binding of the LEDs to the circuitry, but still at a temperature low enough that the substrate and circuitry on the substrate are not damaged (fig 2f).

[0039] The described method allows for the formation of the LED-housing assembly in a process involving temperatures at which the circuitry and the substrate would be damaged. This allows for the use of inorganic materials to be used as housing and contact layer materials.

[0040] It is to be understood that the above-mentioned preferred embodiments are provided for illustrative purposes only, and the invention is only limited to the scope of the appended claims. Those skilled in the art will realize that variations of the present invention is possible, which still falls under the scope of the claims.

[0041] The substrate may be any substrate suitable on which a circuitry may be arranged. Commonly used substrates are well known in the art and include, for example, silicon substrates and aluminum nitride substrates.

[0042] The circuitry comprises a pattern of an electrically conducting material, such as metallic or non-metallic electrically conducting compounds. In fig 2, the circuitry is arranged to connect all LEDs in series. However, other circuitry configurations are possible, such as parallel connection or separate connection of each LED.

[0043] Metal bumps may be used to connect the LEDs to the circuitry, and comprises an electrically conducting material, such as a metal, for example gold or tin. They are arranged on the circuitry in a pattern, which corresponds to the positioning of the LEDs in the housing. Thus, after the LEDs are arranged in the housing, the location of the contact pads of the LEDs fits on the pattern of the metal bumps.

[0044] Light-emitting diodes suitable for use with the present invention include LEDs capable of emitting light in the range from ultra-violet to infrared light.

[0045] As used herein the term "light-emitting diodes" refers to diodes emitting light in any wavelength interval from UV-light to infrared light, and is also taken to include laser diodes.

[0046] Examples of LEDs suitable for use in the present invention include those constructed by growing n/p light-emitting layers on sapphire (single crystal alumina) substrates, to obtain a LED having a flat profile with the connectors to both the cathode and the anode of the diode located on the lower side LED, i.e. no wire bonding is located on the upper side of the LED, i.e. the side of the LED mainly emitting light ("flip-chip"-LEDs). Such LEDs are mounted in the housing with the upper side facing the housing, such that the connectors are easily accessible.

[0047] In preferred embodiments of the present invention, the LEDs are blue or UV emitting diodes, as blue/UV light easily can be converted into light of other colors by luminescent compounds.

[0048] High-power LEDs, with an effect of 3 Watts per square mm or more, may advantageously be used in the present invention.

[0049] The contact layer functions as a layer that optically connects and physically binds a LED to the housing. Moreover, the contact layer acts as a light-extracting layer, extracting the light out of the light-emitting diode.

[0050] The contact layer material may be a translucent, especially transparent, glass material, for example chosen from the group comprising chalcogenide glass, lead silicate glass, tellurate glass, bismuth glass, etc.

[0051] As used herein, the term "translucent" is taken to also include "transparent", in the meaning that a transparent material is a translucent material. A glass material is advantageously due to the good optical properties of glass and that they, at a temperature above the softening point for the material, at which the glass material is liquid, but below the melting point for the housing material, easily can be arranged in a recess in the housing, either by dispensing the liquid glass material in the recesses or by melting disposed glass in the recesses.

[0052] Other contact layer materials suitable for use in the present invention include aluminum phosphate and aluminum oxide, as well as mixtures thereof.

[0053] Preferably, the contact layer material has a refractive index in the range from at least 1,7 up to 2,3, or even higher.

[0054] The thickness of the contact layer can vary in the range of from less than 2 μm to higher than 150 μm. The contact layer material can further contain luminescent compounds to convert the color of light emitted by the LED into a desired color, for example for converting blue light into green or red light, or for converting UV-light into blue, green or red light. Such luminescent compounds suitable for incorporation into the contact layer material are known to those skilled in the art. Examples include, but are not limited to luminescent silicon nitride compounds, such as $Sr_2Si_5N_8$ doped with europium, aluminum or oxygen.

[0055] As used herein, the term "luminescent material" comprises both fluorescent and phosphorescent materials, which absorbs light of a wavelength or wavelength interval and emits light of another wavelength or wavelength interval.

[0056] In embodiments of the present invention comprising several LEDs arranged in separate recesses, different contact materials, e.g. comprising different luminescent materials, may be arranged in different recesses. Thus, an array of LEDs of the same type, for example UV emitting diodes may be arranged in the housing, where the light emitted from different LEDs are converted into different colors by different luminescent materials in the contact layer, for example into blue, green and red light respectively to provide a RGB-array. Such an array can be used to provide white light, or, when separate LEDs can be driven independently, to provide a color variable light-emitting device. Alternatively, to form a RGB-array, an array of blue and green LEDs may be arranged in a housing, wherein the light from some of the blue or green LEDs may be converted by a blue-to-red or green-to-red luminescent material, respectively, in the contacting layer for some of the LEDs.

[0057] The housing of the present invention is made of an inorganic translucent material. The material may for example be a ceramic material including, but limited to materials selected from the group consisting of polycrystalline alumina (Al_2O_3), yttrium-aluminum-garnet (YAG, $Y_3Al_5O_{12}$), yttria (Y_2O_3), ($MgAl_2O_4$), MgAlON, aluminum nitride (AlN), AlON, SiON, SiAlON, and titania

(TiO_2) doped zirconia (ZrO_2) and mixtures thereof. Other materials suitable for use with the present invention include for example ceramic glass composites, for example AlMgSi-oxide, and glass materials having a thermal expansion coefficient near that of sapphire, and having a melting point higher than the softening point of the contact layer material.

[0058] Ceramic materials suitable for use in the present invention is highly heat resistant and can stand the high temperatures dissipated by high-power LEDs and used when the contact layer material is filled into the recesses. Preferably the housing material is resistant to even higher temperatures, such as the temperatures used in optional steps of connecting the housing to a ceramic or glassy light extracting body.

[0059] The housing of the present invention has several functions. One function is to arrange the LEDs in desired positions and orientations before the LED-housing assembly is arranged on the substrate and the LEDs are connected to the circuitry.

[0060] Preferably, the recess in the housing is sized such that a LED easily fits in the recess, but becomes arranged in a desired location and direction to also be properly connected to the circuitry. This is especially advantageous when an array of LEDs is arranged in individual recesses in a housing. All the LEDs becomes properly located and aligned in the housing to fit on a preproduced circuitry.

[0061] In the embodiment shown in figure 1 and 2, each LED is arranged in a separate recess, and the walls of the recesses constitutes the positioning and orientating means for each LED. However in other embodiments of the present invention, more than one LED may be arranged in a recess, and in such cases, the positioning and orientating means may, for example, be constituted by elements which prevents LEDs from moving or rotating in the plane of the LEDs, but which means does not form walls separating the recess into a plurality of recesses.

[0062] Another, optional, function of the housing is to convert the color of the light received by the housing into a desired color. In such instances, the housing material comprises a luminescent compound, or combinations of two or more luminescent compounds. Such luminescent compound(s) may preferably be selected from yttrium-aluminum-garnet doped with cerium, praseodymium, europium or combinations thereof, for example (YAG:Ce), (YAG:Ce,Pr), and (YAG:Ce,Eu).

[0063] Different combinations of materials for the contact layer and the housing are possible, as will be realized by those skilled in the art.

[0064] For example, an array of LEDs can be provided with contact materials comprising luminescent materials to provide for example an RGB-array, which can provide white or color variable light. In such a case, the housing does not need to comprise any phosphor material to further convert the color of the light.

[0065] In another example, an array of blue LEDs may be used with a contact layer not comprising any luminescent material, and a housing comprising for example YAG:Ce to convert the blue light into white light. In the latter case however, some of the blue LEDs can optionally be substituted for green LEDs, and/or the contact material of some blue LEDs may optionally be provided with a blue-to-red-converting luminescent material to change the color temperature of the produced light.

[0066] Furthermore, other optical components may be used in combination with the device of the present invention. For example, collimating, focusing or dispersing lenses may be arranged on the housing to alter the direction of the light emitted by the LEDs. A specular reflector arranged on the substrate around the housing to collimate/focus the emitted light, as shown in fig 1 may also be used.

Claims

1. A method for the manufacture of a light-emitting device, comprising:

   providing a housing (4) having at least one recess (7), said housing (4) comprising a translucent inorganic material;
   arranging positioning and orientating means in each of said at least one recess (7);
   characterized in
   arranging a translucent inorganic contact layer material (5) in each of said at least one recess (7), wherein said contact layer material (5) is arranged in said recess (7) at temperature above the softening temperature for said contact layer material (5); and then in each of said at least one recess (7), arranging a light-emitting diode (2) on said contact layer material (5) arranged in the respective recess (7), such that said light emitting diode (2) is positioned and orientated by said orientating and positioning means, and said contact layer material (5) and said housing (4) receives at least part of light emitted by said light-emitting diode (2), wherein said light-emitting diode (2) is arranged in the respective recess (7) at a temperature between the glass temperature and the softening temperature of said contact layer material (5), wherein said temperature between the glass temperature and the softening temperature is in the range from 250°C to lower than 350°C.

2. The method according to claim 11, further comprising connecting said light-emitting diode or diodes (2) to a circuitry (8).

3. The method according to claim 1 or 2, wherein said temperature above the softening temperature for said contact layer material (5) is in the range of from

300°C to 1600°C.

4. A light-emitting device obtainable by the method of claim 1 comprising an array of a plurality of light-emitting diodes (2), which in operation emits light, and a housing (4) arranged to receive at least a portion of said light, said housing comprises a translucent inorganic material and is provided with an array of a plurality of recesses (7), each comprising positioning and orientating means, ,
each of said plurality of light-emitting diodes is arranged in a respective one of the plurality of recesses (7) and being positioned and orientated by said positioning and orientating means, and
wherein in each of the plurality of recesses (7) a translucent inorganic contact layer material (5) is arranged between said light-emitting diode or diodes in said recess (2) and said housing (2) to receive at least a portion of said light and to connect said light-emitting diode or diodes in said recess (2) to said housing (4),
the translucent inorganic contact layer material (5) having a glass temperature and a softening temperature such that a temperature between said glass temperature said softening temperature is in the range from 250°C to lower than 350°C.

5. The light-emitting device according to claim 4, wherein each of the plurality of recesses (7) comprises walls which constitute said positioning and orientating means.

6. The light-emitting device according to claim 4 or 5, further comprising a substrate (1) on which a circuitry (8) is arranged, and wherein said plurality of light-emitting diodes (2) are arranged on and connected to said circuitry.

7. The light-emitting device according to claim 6, wherein a first light-emitting diode is positioned in a first location and orientated in a first orientation and a second light-emitting diode is positioned in a second position and orientated in a second orientation, wherein said circuitry is arranged on and connected to said first light-emitting diode at said first location and arranged on and connected to said second light-emitting diode at said second location.

8. The light-emitting device according to claim 7, wherein said first light emitting diode is arranged in a first recess and said second light emitting diode is arranged in a second recess.

9. The light-emitting device according to any of claims 4-8, wherein said translucent inorganic material comprised in said housing comprises a ceramic material selected from the group consisting of polycrystalline alumina Al_2O_3, yttrium-aluminum-garnet YAG, $Y_3Al_5O_{12}$ yttria Y_2O_3, $MgAl_2O_4$, MgAlON, AlON, AlMgSi-oxide, SiON, SiAlON and titania TiO_2 doped zirconia ZrO_2 and mixtures thereof.

10. The light-emitting device according to any of claims 4-9, wherein a phosphor compound is comprised in the housing and comprises yttrium-aluminum-garnet (YAG) doped with an element selected from the group consisting of cerium, praseodymium, europium and combinations thereof.

11. The light-emitting device according to any of claims 4-10, wherein said contact layer material comprises a glass material selected from the group consisting of chalcogenide glass, lead silicate, tellurate glass, bismuth glass and combinations thereof.

12. The light-emitting device according to any of claims 4-11, wherein said contact layer material comprises a luminescent material.

13. The light-emitting device according to any of the claims 7-12, wherein a first contact layer material is arranged between said first light-emitting diode and said housing and a second contact layer material is arranged between said second light-emitting diode and said housing, and wherein at least one of said first and second contact layer materials comprise a luminescent material.

Patentansprüche

1. Verfahren für die Herstellung einer Leuchtvorrichtung, umfassend:

Bereitstellen eines Gehäuses (4) mit mindestens einer Vertiefung (7), wobei das Gehäuse (4) ein durchsichtiges anorganisches Material umfasst;
Anordnen eines Positionierungs- und Ausrichtungsmittels in jeder der mindestens einen Vertiefung (7);
gekennzeichnet durch
Anordnen eines durchsichtigen anorganischen Kontaktschichtmaterials (5) in jeder der mindestens einen Vertiefung (7), wobei das Kontaktschichtmaterial (5) in der Vertiefung (7) bei einer Temperatur über der Erweichungstemperatur für das Kontaktschichtmaterial (5) angeordnet ist; und
dann in jeder der mindestens einen Vertiefung (7) Anordnen einer Leuchtdiode (2) auf dem Kontaktschichtmaterial (5), das in der jeweiligen Vertiefung (7) angeordnet ist, sodass die Leuchtdiode (2) durch das Ausrichtungs- und Positionierungsmittel positioniert und ausgerichtet wird, und das Kontaktschichtmaterial (5)

und das Gehäuse (4) mindestens einen Teil von Licht empfängt, das durch die Leuchtdiode (2) ausgestrahlt wird, wobei die Leuchtdiode (2) in der jeweiligen Vertiefung (7) bei einer Temperatur zwischen der Glastemperatur und der Erweichungstemperatur des Kontaktschichtmaterials (5) angeordnet ist, wobei die Temperatur zwischen der Glastemperatur und der Erweichungstemperatur in einem Bereich von 250 °C bis unter 350 °C liegt.

2. Verfahren nach Anspruch 11, weiter umfassend ein Verbinden der Leuchtdiode oder Leuchtdioden (2) mit einem Schaltkreis (8).

3. Verfahren nach Anspruch 1 oder 2, wobei die Temperatur über der Erweichungstemperatur für das Kontaktschichtmaterial (5) im Bereich von 300 °C bis 1600 °C liegt.

4. Leuchtvorrichtung, die durch das Verfahren nach Anspruch 1 erhältlich ist, umfassend eine Gruppe von mehreren Leuchtdioden (2), die in Betrieb Licht ausstrahlen, und ein Gehäuse (4), das angeordnet ist, mindestens einen Teil des Lichts zu empfangen, wobei das Gehäuse ein durchsichtiges anorganisches Material umfasst und mit einer Gruppe von mehreren Vertiefungen (7) versehen ist, von welchen jede Positionierungs- und Ausrichtungsmittel umfasst,
wobei jede der mehreren Leuchtdioden in einer jeweiligen der mehreren Vertiefungen (7) angeordnet ist und durch das Positionierungs- und Ausrichtungsmittel positioniert und ausgerichtet ist, und
wobei in jeder der jeweiligen Vertiefungen (7) ein durchsichtiges anorganisches Kontaktschichtmaterial (5) zwischen der Leuchtdiode oder den Leuchtdioden in der Vertiefung (2) und dem Gehäuse (2) angeordnet ist, um mindestens einen Teil des Lichts zu empfangen und die Leuchtdiode oder Leuchtdioden in der Vertiefung (2) mit dem Gehäuse (4) zu verbinden,
wobei das durchsichtige anorganische Kontaktschichtmaterial (5) eine Glastemperatur und eine Erweichungstemperatur hat, sodass eine Temperatur zwischen der Glastemperatur und der Erweichungstemperatur im Bereich von 250 °C bis unter 350 °C liegt.

5. Leuchtvorrichtung nach Anspruch 4, wobei jede der mehreren Vertiefungen (7) Wände umfasst, die das Positionierungs- und Ausrichtungsmittel bilden.

6. Leuchtvorrichtung nach Anspruch 4 oder 5, weiter umfassend ein Substrat (1), auf dem ein Schaltkreis (8) angeordnet ist, und wobei die mehreren Leuchtdioden (2) auf dem Schaltkreis angeordnet und mit diesem verbunden sind.

7. Leuchtvorrichtung nach Anspruch 6, wobei eine erste Leuchtdiode an einer ersten Stelle positioniert und in einer ersten Ausrichtung ausgerichtet ist und eine zweite Leuchtdiode an einer zweiten Position positioniert und in einer zweiten Ausrichtung ausgerichtet ist, wobei der Schaltkreis auf der ersten Leuchtdiode an der ersten Stelle angeordnet und mit dieser verbunden ist und auf der zweiten Leuchtdiode an der zweiten Stelle angeordnet und mit dieser verbunden ist-

8. Leuchtvorrichtung nach Anspruch 7, wobei die erste Leuchtdiode in einer ersten Vertiefung angeordnet ist und die zweite Leuchtdiode in einer zweiten Vertiefung angeordnet ist.

9. Leuchtvorrichtung nach einem der Ansprüche 4-8, wobei das durchsichtige anorganische Material, das im Gehäuse enthalten ist, ein keramisches Material umfasst, das ausgewählt ist aus der Gruppe bestehend aus polykristallinem Aluminiumoxid Al_2O_3, Yttrium-Aluminium-Granat YAG, $Y_3Al_5O_{12}$, Yttriumoxid Y_2O_3, $MgAl_2O_4$, MgAlON, AlON, AlMgSi-Oxid, SiON, SiAlON und Titanoxid-, TiO_2, dotiertem Zirkonoxid ZrO_2 und Gemischen davon.

10. Leuchtvorrichtung nach einem der Ansprüche 4-9, wobei eine Phosphorverbindung in dem Gehäuse enthalten ist und Yttrium-Aluminium-Granat YAG dotiert mit einem Element ausgewählt aus der Gruppe bestehend aus Cer, Praseodym, Europium und Kombinationen davon umfasst.

11. Leuchtvorrichtung nach einem der Ansprüche 4-10, wobei das Kontaktschichtmaterial ein Glasmaterial umfasst, das ausgewählt ist aus der Gruppe bestehend aus Chalcogenidglas, Bleisilikat, Telluratglas, Wismutglas und Kombinationen davon.

12. Leuchtvorrichtung nach einem der Ansprüche 4-11, wobei das Kontaktschichtmaterial ein lumineszierendes Material umfasst.

13. Leuchtvorrichtung nach einem der Ansprüche 7-12, wobei ein erstes Kontaktschichtmaterial zwischen der ersten Leuchtdiode und dem Gehäuse angeordnet ist und ein zweites Kontaktschichtmaterial zwischen der zweiten Leuchtdiode und dem Gehäuse angeordnet ist und wobei mindestens eines von dem ersten und zweiten Kontaktschichtmaterial ein lumineszierendes Material umfasst.

Revendications

1. Procédé de fabrication d'un dispositif électroluminescent, comprenant :

la fourniture d'un boîtier (4) ayant au moins une cavité (7), ledit boîtier (4) comprenant un matériau inorganique translucide ;
l'agencement de moyens de positionnement et d'orientation dans chacun desdites au moins une cavité (7) ;
caractérisé par :

l'agencement d'un matériau de couche de contact inorganique translucide (5) dans chacun desdites au moins une cavité (7), dans lequel ledit matériau de couche de contact (5) est agencé dans ladite cavité (7) à une température supérieure à la température de ramollissement pour ledit matériau de couche de contact (5) ; et ensuite
dans chacune desdites au moins une cavité (7), l'agencement d'une diode électroluminescente (2) sur ledit matériau de couche de contact (5) agencé dans la cavité respective (7) de sorte que ladite diode électroluminescente (2) soit positionnée et orientée par lesdits moyens d'orientation et de positionnement et que ledit matériau de couche de contact (5) et ledit boîtier (4) reçoivent au moins une partie de la lumière émise par ladite diode électroluminescente (2), dans lequel ladite diode électroluminescente (2) est agencée dans la cavité respective (7) à une température comprise entre la température de verre et la température de ramollissement dudit matériau de couche de contact (5), dans lequel ladite température comprise entre la température de verre et la température de ramollissement se situe dans la plage allant de 250 °C à moins de 350 °C.

2. Procédé selon la revendication 11, comprenant en outre la connexion de ladite diode ou desdites diodes électroluminescentes (2) à une circuiterie (8).

3. Procédé selon la revendication 1 ou 2, dans lequel ladite température située au-dessus de la température de ramollissement pour ledit matériau de couche de contact (5) se situe dans la plage de 300 °C à 1600 °C.

4. Dispositif électroluminescent qui peut être obtenu par le procédé de la revendication 1, comprenant un réseau d'une pluralité de diodes électroluminescentes (2), qui émettent en service de la lumière et un boîtier (4) agencé pour recevoir au moins une partie de ladite lumière, ledit boîtier comprenant un matériau inorganique translucide et étant pourvu d'un réseau d'une pluralité de cavités (7), chacune comprenant des moyens de positionnement et d'orientation, chacune de ladite pluralité de diodes électroluminescentes est agencée dans l'une respective de la pluralité de cavités (7) et étant positionnée et orientée par lesdits moyens de positionnement et d'orientation, et
dans lequel, dans chacune de la pluralité de cavités (7), un matériau de couche de contact inorganique translucide (5) est agencé entre ladite diode ou lesdites diodes électroluminescentes dans ladite cavité (2) et ledit boîtier (2) pour recevoir au moins une partie de ladite lumière et connecter ladite diode ou lesdites diodes électroluminescentes dans ladite cavité (2) audit boîtier (4),
le matériau de couche de contact inorganique translucide (5) ayant une température de verre et une température de ramollissement telles qu'une température comprise entre ladite température de verre et ladite température de ramollissement se situe dans la plage allant de 250 °C à moins de 350 °C.

5. Dispositif électroluminescent selon la revendication 4, dans lequel chacune de la pluralité de cavités (7) comprend des parois qui constituent lesdits moyens de positionnement et d'orientation.

6. Dispositif électroluminescent selon la revendication 4 ou 5, comprenant en outre un substrat (1) sur lequel une circuiterie (8) est agencée et dans lequel ladite pluralité de diodes électroluminescentes (2) est agencée sur ladite circuiterie et connectée à celle-ci.

7. Dispositif électroluminescent selon la revendication 6, dans lequel une première diode électroluminescente est positionnée dans un premier emplacement et orientée dans une première orientation et une seconde diode électroluminescente est positionnée dans une seconde position et orientée dans une seconde orientation, dans lequel ladite circuiterie est agencée sur ladite première diode électroluminescente et connectée à celle-ci dans ledit premier emplacement et agencée à ladite seconde diode électroluminescente et connectée à celle-ci dans ledit second emplacement.

8. Dispositif électroluminescent selon la revendication 7, dans lequel ladite première diode électroluminescente est agencée dans une première cavité et ladite seconde diode électroluminescente est agencée dans une seconde cavité.

9. Dispositif électroluminescent selon l'une quelconque des revendications 4-8, dans lequel ledit matériau inorganique translucide compris dans ledit boîtier comprend un matériau céramique choisi dans le groupe constitué d'une alumine polycristalline Al_2O_3, d'un complexe d'yttrium-aluminium-grenat YAG, $Y_3Al_5O_{12}$, d'un oxyde d'yttrium Y_2O_3, de $MgAl_2O_4$, de MgAlON, d'AlON, d'un oxyde d'AlMgSi, de SiON, de SiAlON et d'un oxyde de zirconium ZrO_2

dopé à l'oxyde de titane TiO_2 et de leurs mélanges.

10. Dispositif électroluminescent selon l'une quelconque des revendications 4-9, dans lequel un composé luminescent est compris dans le boîtier et comporte de l'yttrium-aluminium-grenat (YAG) dopé avec un élément choisi dans le groupe constitué du cérium, du praséodyme, de l'europium et de leurs combinaisons.

11. Dispositif électroluminescent selon l'une quelconque des revendications 4-10, dans lequel ledit matériau de couche de contact comprend un matériau vitreux choisi dans le groupe constitué du verre de chalcogénure, du silicate de plomb, du verre au tellurate, du verre au bismuth et de leurs combinaisons.

12. Dispositif électroluminescent selon l'une quelconque des revendications 4-11, dans lequel ledit matériau de couche de contact comprend un matériau luminescent.

13. Dispositif électroluminescent selon l'une quelconque des revendications 7-12, dans lequel un premier matériau de couche de contact est agencé entre ladite première diode électroluminescente et ledit boîtier et un second matériau de couche de contact est agencé entre ladite seconde diode électroluminescente et ledit boîtier, et dans lequel au moins l'un desdits premier et second matériaux de couche de contact comprend un matériau luminescent.

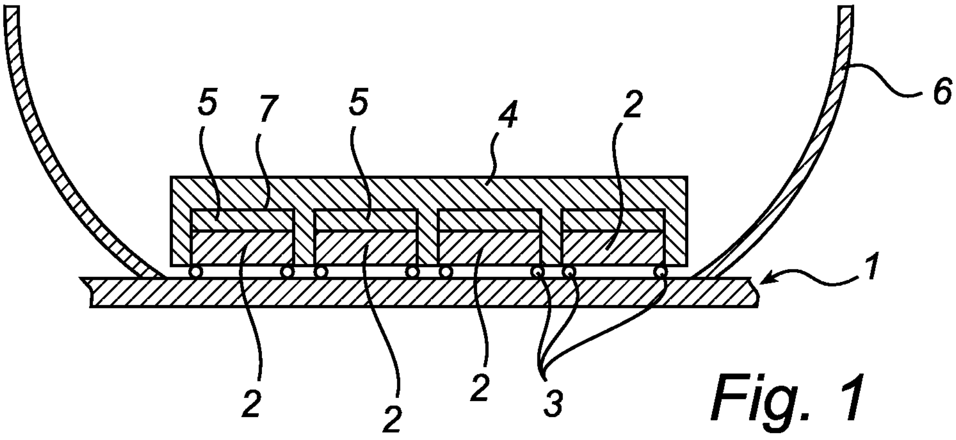


Fig. 1

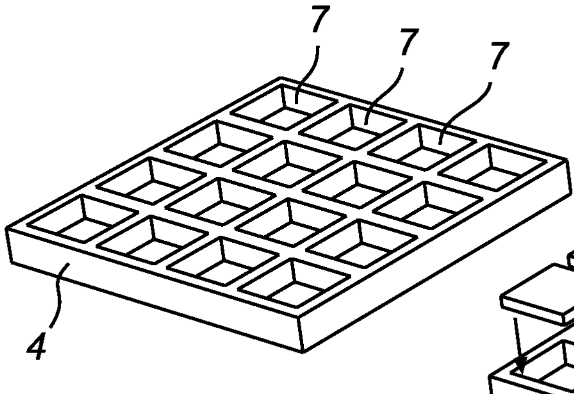


Fig. 2a

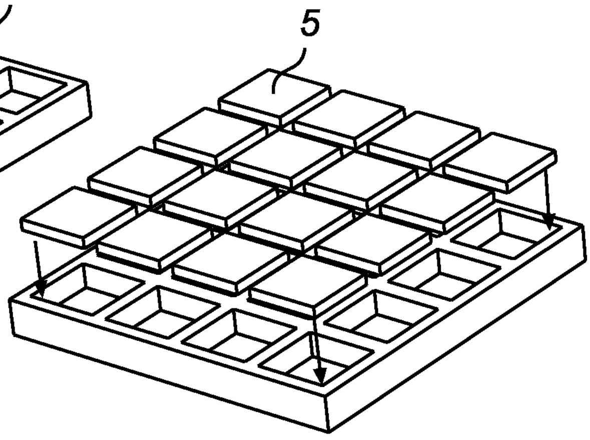


Fig. 2b

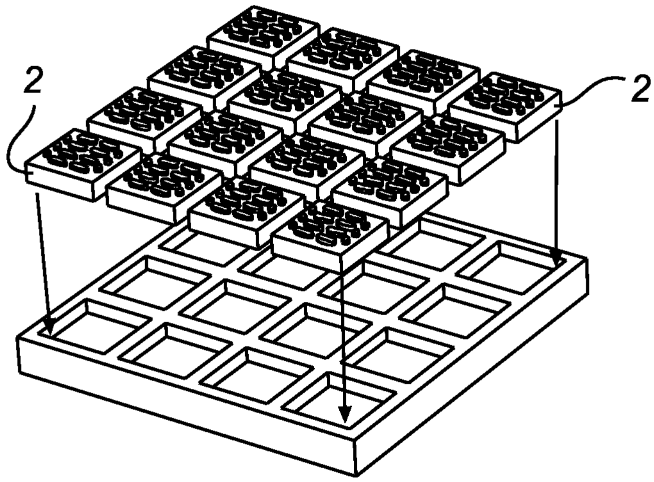


Fig. 2c

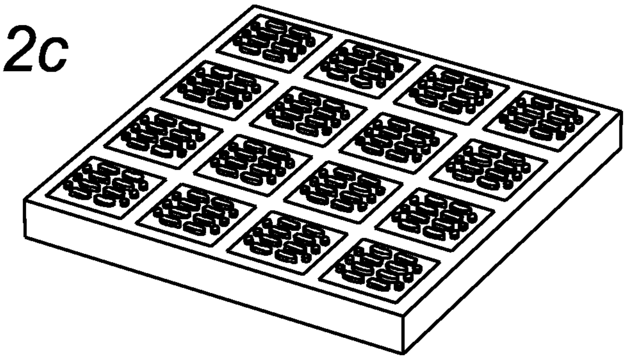
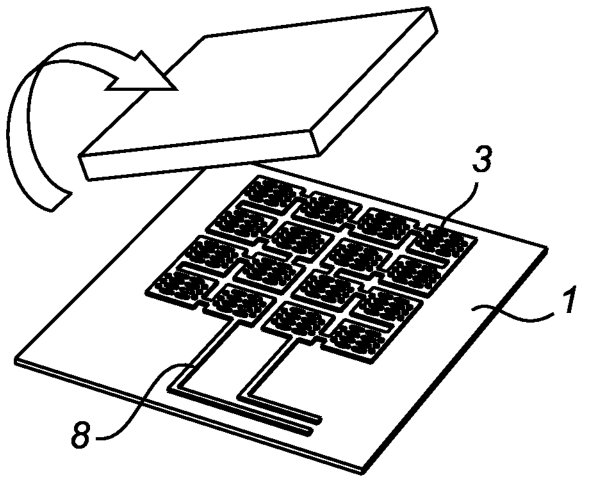


Fig. 2d



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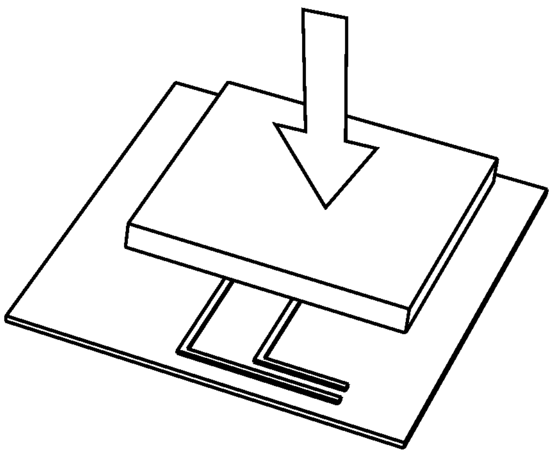

Fig. 2f

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2003179270 A **[0006]**
- EP 1267420 A2 **[0010]**

专利名称(译)	具有无机外壳的发光装置		
公开(公告)号	EP1815540B1	公开(公告)日	2019-07-31
申请号	EP2005803924	申请日	2005-11-15
[标]申请(专利权)人(译)	皇家飞利浦电子股份有限公司		
申请(专利权)人(译)	皇家飞利浦电子N.V.		
[标]发明人	BECKERS LUCAS J A M		
发明人	BECKERS, LUCAS, J., A., M.		
IPC分类号	H01L51/52 H01L25/075 F21K99/00		
CPC分类号	H01L51/5271 H01L25/075 H01L25/0753 H01L51/5237 H01L2251/5315 H01L2924/0002 H01L2924/00		
优先权	2004105918 2004-11-19 EP		
其他公开文献	EP1815540A2		
外部链接	Espacenet		

摘要(译)

发光装置技术领域本发明涉及一种发光装置，该发光装置包括至少一个发光的发光二极管，以及用于接收所述光的至少一部分的壳体。壳体包括半透明的无机材料并且设置有至少一个凹部，该凹部包括定位和定向装置。所述至少一个发光二极管布置在所述至少一个凹槽中并且由所述定位和定向装置定位和定向，并且半透明无机接触层材料布置在所述至少一个发光二极管和所述壳体之间。所述至少一个凹槽用于接收至少一部分光并将所述发光二极管连接到所述壳体。

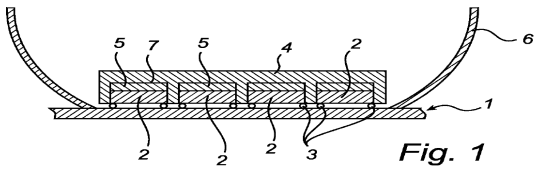

Fig. 1

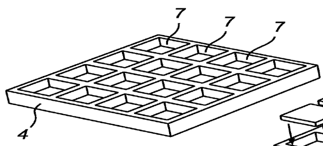

Fig. 2a

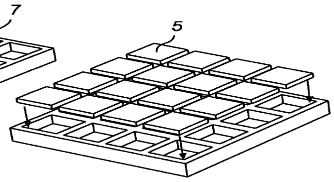

Fig. 2b