

A LUMINESCENT SEMICONDUCTOR COMPONENT

(14)

The present invention relates to a luminescent semiconductor component with a casing member containing a semiconductor body and comprising light transmissive plastics material.

Conventionally, the plastics material for the casing of a luminescent semiconductor component is dyed with organic dyes in order to improve the visibility of light emission from the semiconductor component, particularly during daylight conditions, and to make it more easily readable. Powdered glass or other solid scattering or dispersing materials, such as titanium oxide, zinc sulphide or CaCO_3 may be generally added as the scattering material. For example it is known to add powdered glass from German Patent Specification No. 22 27 322.

The present invention seeks to simplify the manufacture of luminescent semiconductor components by implementing certain component properties, previously achieved by various steps, in a single step.

According to a first aspect of the present invention there is provided a luminescent semiconductor component having a casing of light-transmissive plastics material containing particles which simultaneously determine the light scattering and filtering properties of the casing member with respect to light emitted by the component and passing through the casing member.

Thus the previously separate steps of dying the casing

member and adding scattering particles, are combined by adding to the casing member particles which have predetermined properties with regard to scattering and filtering light. As a result the process of manufacturing luminescent semiconductor components is simplified and these components can be reproduced with consistent properties in an improved manner.

The plastics of the casing member may comprise a clear epoxy resin to which particles of dyed powered glass are added. If high transmission is to be achieved the refractive index of the plastics material has to correspond as far as possible with that of the particle material. If, on the other hand, elevated scattering of the light in the casing is desired, then the material of the casing plastics and of the particles added have different refractive indices.

The particles which are added may comprise a ground filter glass in which the grain size is preferably less than 50 μm . Up to approximately 20% by volume of particles which affect the scattering and filtering characteristics are added to the mouldable plastics.

According to a second aspect of the present invention there is provided an edge filter comprising a casing member of light-transmissive plastics material containing particles which simultaneously determine the light-scattering and filtering properties of the casing member with respect to a luminescent semiconductor component within the casing.

A preferred embodiment of the present invention will now be described by way of example only, with reference to the accompanying drawings, of which:

Fig. 1 is a perspective view of a luminescent semiconductor component in accordance with the present invention; and

Fig. 2 is a graph showing various light transmission curves related to the component of Fig. 1.

Referring now to Fig. 1 there is shown a single luminescent semiconductor component (e.g. a diode) comprising a plastics casing member 1 and two electrical leads 3 and 4 leading out of the plastics casing. Inside the casing member the semiconductor component 5 is electrically connected to the supply lead 3. The second electrode connection of the light emitting semiconductor diode is connected in electrically conductive fashion to the second supply lead 4 via a connecting wire 6.

The casing member may for example comprise epoxy resin with a refractive index of $n_d=1.5$. However other commercially available mouldable plastics materials can be considered, preferably those which are clear and have a refractive index in the region of between 1.45 and 1.6.

The added particles 2 are located in the plastics member 1 and determine the transmission and filtering characteristics and the scattering property of the light emitted by the semiconductor component 5. These particles 2 may for example comprise a ground filter glass. A red filter glass obtainable under the name RG630 may be employed. The casing member 1 preferably comprises 2 - 4% by volume of added particles which have a grain size of approximately $1\mu m$.

The refractive index of the glass or other added particles can be adapted to the refractive index of the plastics to a greater or lesser extent depending on the desired dispersion effect. The glass used preferably has a refractive index of between 1.3 and 2. If the refractive index of the respective particle material is almost identical to that of the respective plastics, then there is very little scattering dispersion of the radiated light and therefore there is particularly good transmission. The greater the divergence between the refractive indices, the greater the scattering of the light in the plastics member, so that the light source appears diffused to the observer.

In Figure 2 there is shown the path of the transmission curves against wavelength for a red filter glass and for a plastics casing member in which particles comprising a ground red filter glass are embedded in the plastics member. Curve a) show the path of the transmission over the wavelength for pure red filter glass with the trade name RG630. This glass is an edge filter, since almost all wavelengths under 630nm are eliminated. At approximately 630nm the transmission rises sharply from 0 to approximately 85%.

Curve b) shows the transmission curve against wavelength of a plastics member comprising epoxy resin with the trade name OS1600, to which approximately 2% by volume of ground red filter glass of the type RG630 has been added. As is apparent from this curve the transmission is in fact reduced to just over 70% at its maximum; apart from this, however, the same function curve, characteristic of an edge filter, is achieved. The particles added determine both the filtering characteristics and the scattering of the radiated

light. Changes in these properties can be achieved by changing the grain size of the particles added, the type of glass and the mixture ratio.

- 5 The composition of casing members for luminescent semiconductor components may be used to produce filters with a steep flank and matched to certain detectors, band filters or edge filters. The shaping of the casing members can be modified to be suitable for light
- 10 emitting semiconductor components in discrete or integrated form e.g. for displaying digits, letters or other characters.



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Claims

1. A luminescent semiconductor component having a casing member of light-transmissive plastics material containing particles which simultaneously scatter and absorb part of the light emitted by the component so as to determine the light scattering and filtering properties of the casing member with respect to light emitted by the component and passing out through the casing member.
2. A component according to claim 1 wherein the plastics material comprises a clear epoxy resin.
3. A component according to claim 1 or 2 wherein the particles comprise a coloured glass powder.
4. A component according to any preceding claim wherein the particles comprise ground filter glass.
5. A component according to any preceding claim wherein the grain size of the particles added is less than 50 μm .
6. A component according to any preceding claim wherein up to 20% by volume of the particles are added to the plastics material.
7. A component according to any preceding claim wherein the casing member serves as an edge filter.



8. A luminescent semiconductor component substantially as herein described with reference to the accompanying drawings.

- 5 9. An edge filter comprising a casing member of light-transmissive plastics material containing particles which simultaneously determine the light-scattering and filtering properties of the casing member with respect to a luminescent semiconductor component within the
- 10 casing.
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