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(54) **SIDE MARKER ILLUMINATION**

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B60Q 3/78	(2017.01)
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B60Q 3/233	(2017.01)

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CPC ***B60Q 3/217*** (2017.02); ***B60Q 1/24*** (2013.01); ***B60Q 1/2665*** (2013.01); ***B60Q 1/323*** (2013.01); ***B60Q 3/233*** (2017.02); ***B60Q 3/68*** (2017.02); ***B60Q 3/745*** (2017.02); ***B60Q 3/78*** (2017.02); ***B60R 1/06*** (2013.01); ***B60R 1/1207*** (2013.01); *B60Q 2400/40* (2013.01)

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See application file for complete search history.

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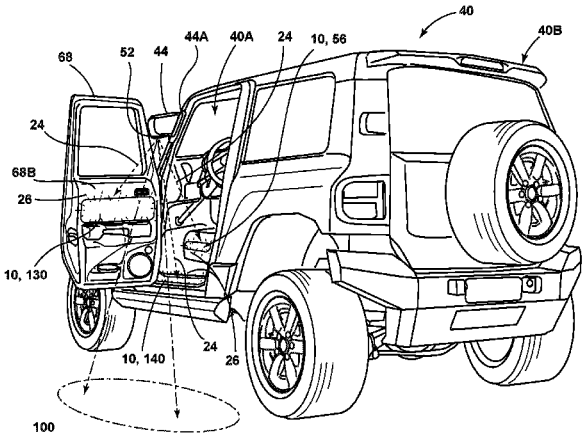
(57) **ABSTRACT**

A vehicle includes a side mirror positioned on an A-pillar. A light assembly is coupled with a bottom surface of the side mirror. The light assembly is configured to illuminate a plurality of photoluminescent structures located within an interior and on an exterior of the vehicle when the vehicle is in a door off configuration.

20 Claims, 5 Drawing Sheets



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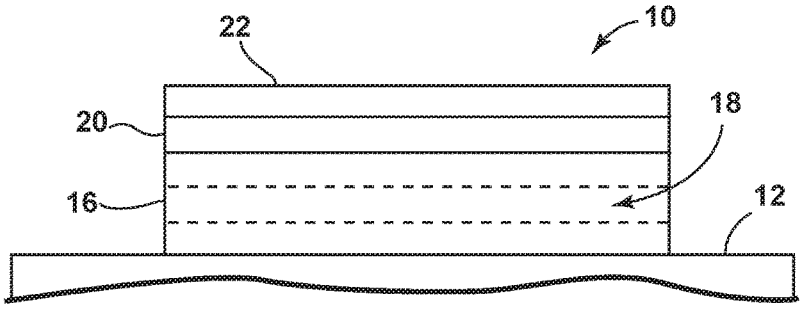

FIG. 1A

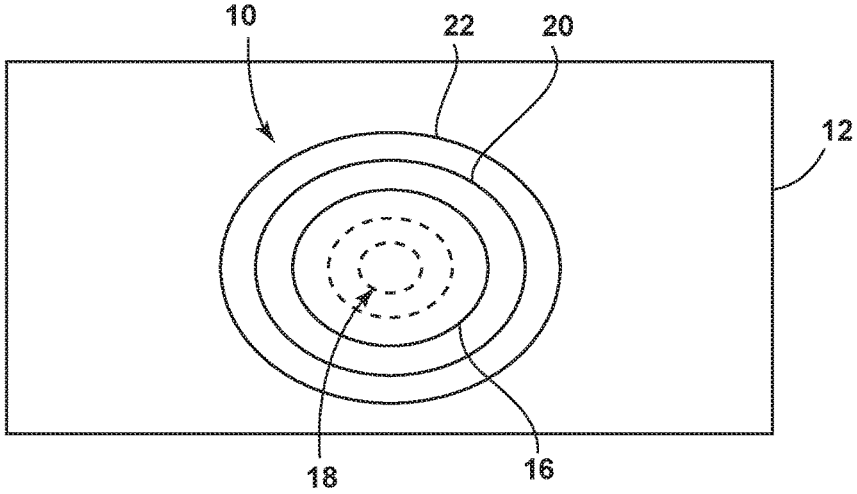

FIG. 1B

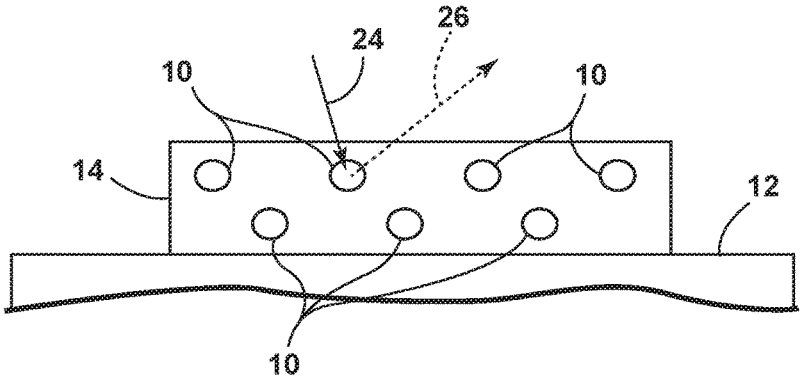

FIG. 1C

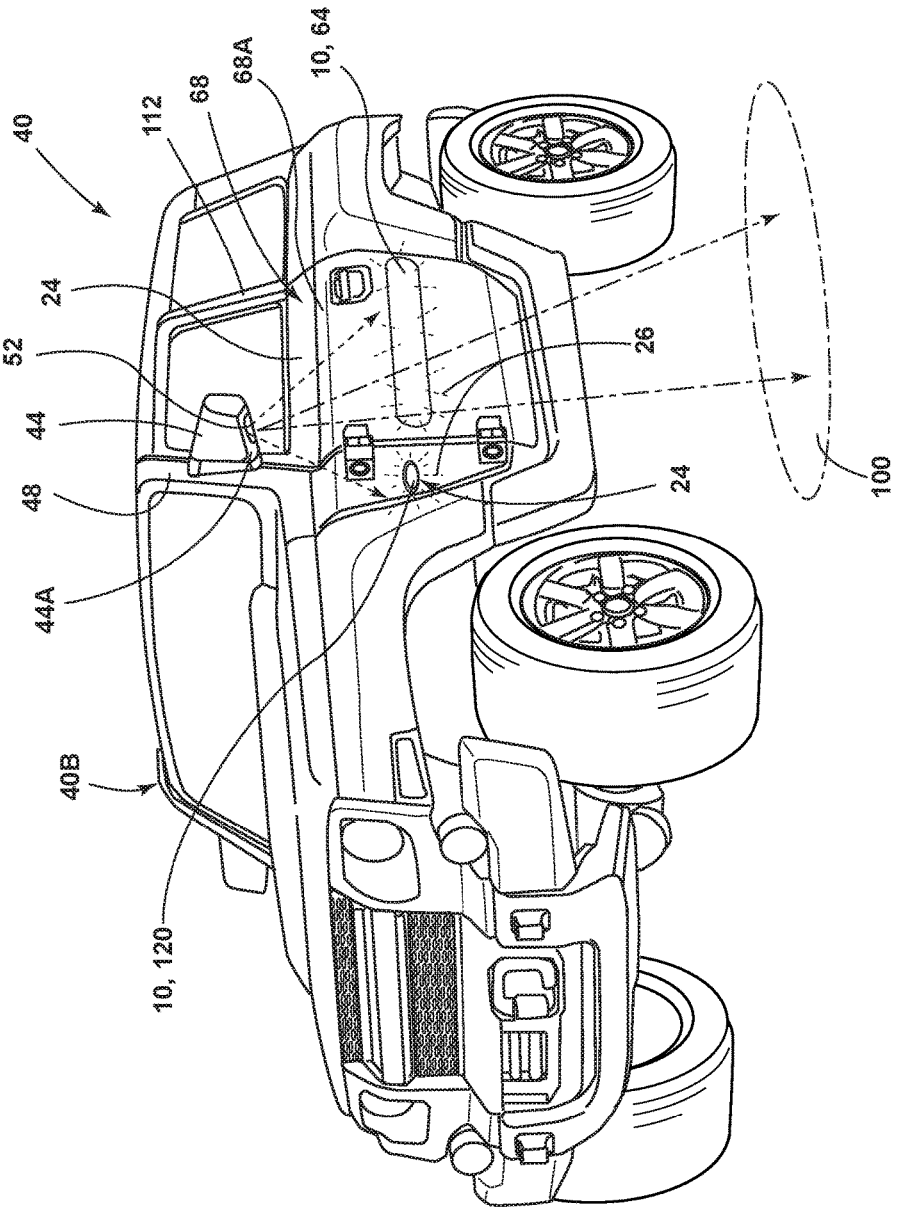

FIG. 2

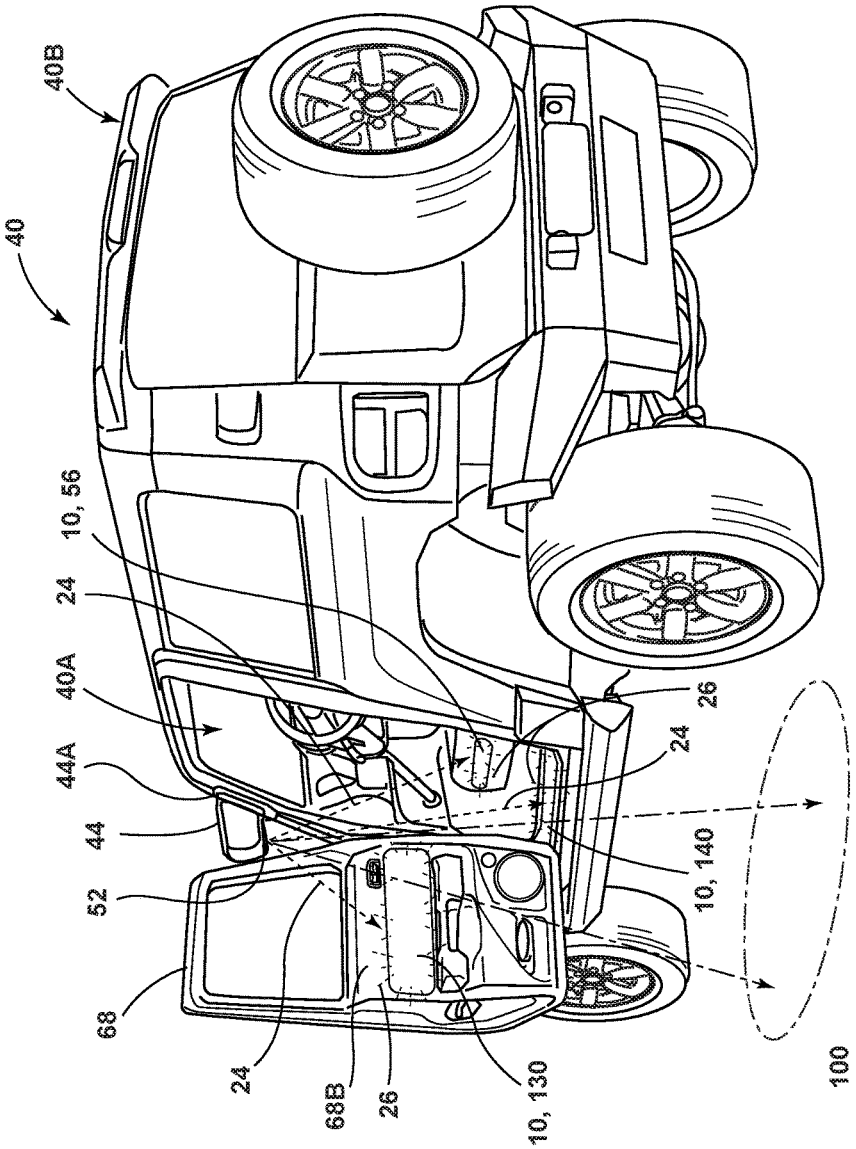

FIG. 3

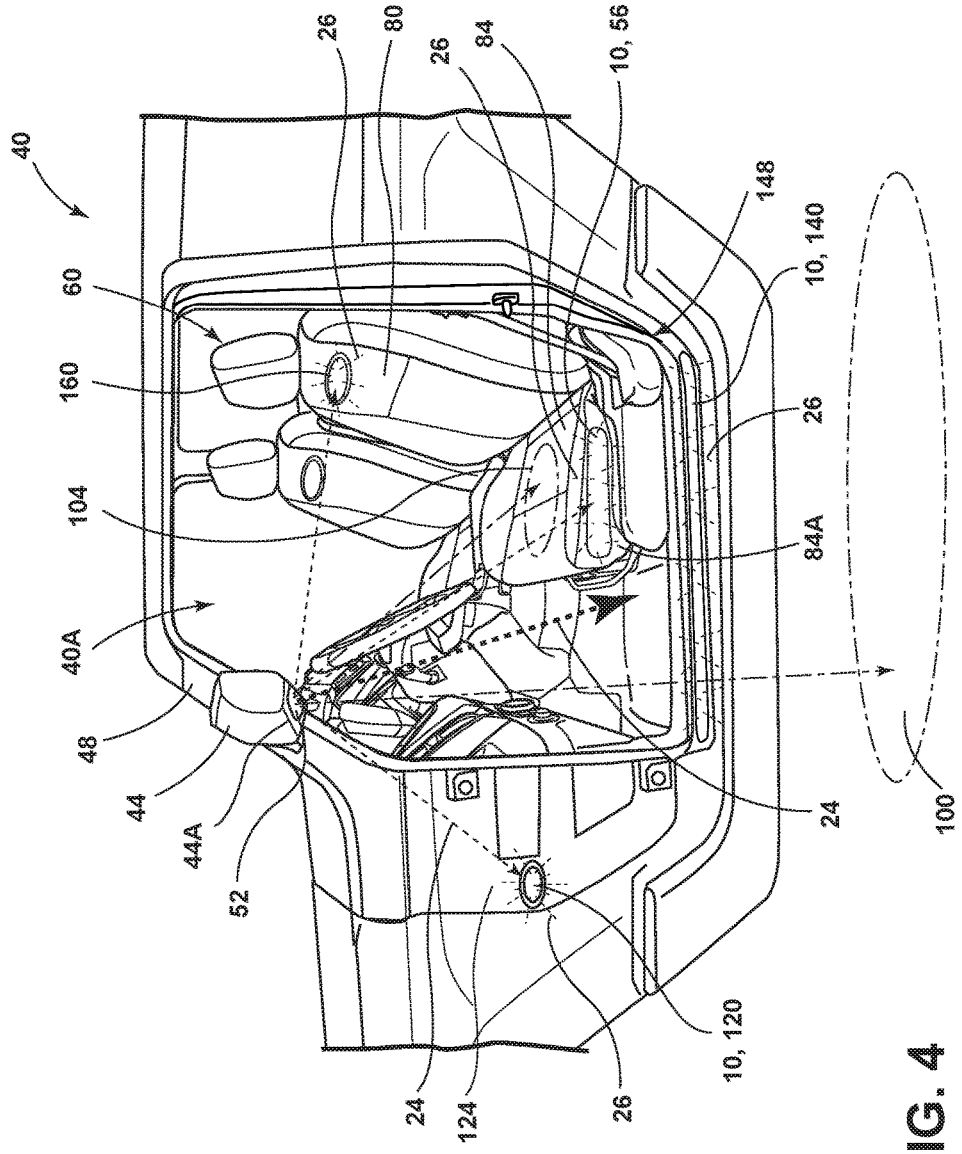
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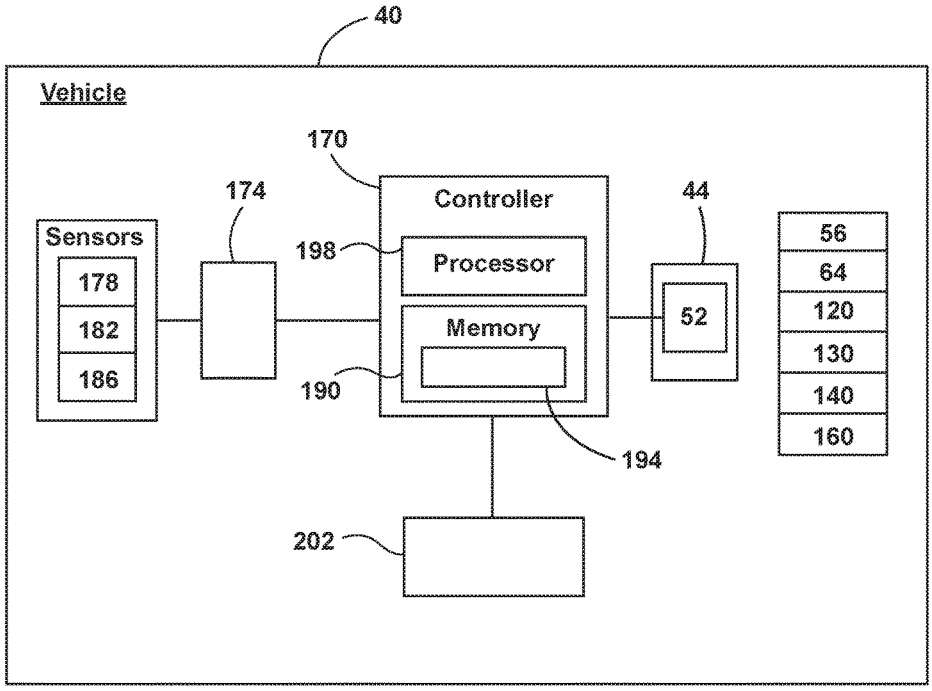
FIG. 4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194
202

FIG. 5

SIDE MARKER ILLUMINATION

FIELD OF THE INVENTION

The present disclosure generally relates to vehicle side markers, and more particularly, to illuminated side markers.

BACKGROUND OF THE INVENTION

Illumination arising from the use of photoluminescent structures offers a unique and attractive viewing experience. It is therefore desired to implement such structures in automotive vehicles for various lighting applications.

SUMMARY OF THE INVENTION

According to one aspect of the present disclosure, a vehicle includes a side mirror positioned on an A-pillar. A light assembly is coupled with a bottom surface of the side mirror. The light assembly is configured to illuminate a plurality of photoluminescent structures located within an interior and on an exterior of the vehicle when the vehicle is in a doors off configuration.

According to another aspect of the present disclosure, a vehicle includes a side mirror positioned on an A-pillar. A light assembly is coupled to the side mirror. An interior side marker is positioned on a seat assembly. An exterior side marker is positioned on an external surface of a door. The light assembly is configured to illuminate the interior and exterior side markers.

According to yet another aspect of the present disclosure, a vehicle includes a side mirror positioned on an A-pillar. A light assembly is coupled to the side mirror. A door is positioned proximate the side mirror operable between closed and open positions. The light assembly is configured to illuminate photoluminescent structures positioned on a seat assembly and an inner surface of the door.

These and other aspects, objects, and features of the present disclosure will be understood and appreciated by those skilled in the art upon studying the following specification, claims, and appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The following is a description of the figures in the accompanying drawings. The figures are not necessarily to scale, and certain features and certain views of the figures may be shown exaggerated in scale or in schematic in the interest of clarity and conciseness.

In the drawings:

FIG. **1**A is a side view of a photoluminescent structure rendered as a coating for use in an assembly according to one embodiment;

FIG. **1**B is a top view of a photoluminescent structure rendered as a discrete particle according to one embodiment;

FIG. **1**C is a side view of a plurality of photoluminescent structures rendered as discrete particles and incorporated into a separate structure;

FIG. **2** is a front perspective view of a vehicle in a "doors on" configuration, according to at least one example;

FIG. **3** is a rear perspective view of a vehicle, according to at least one example;

FIG. **4** is a side perspective view of a vehicle in a "doors off" configuration, according to at least one example; and

FIG. **5** is a block diagram of the vehicle, according to at least one example.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Additional features and advantages of the invention will be set forth in the detailed description which follows and will be apparent to those skilled in the art from the description, or recognized by practicing the invention as described in the following description, together with the claims and appended drawings.

As used herein, the term "and/or," when used in a list of two or more items, means that any one of the listed items can be employed by itself, or any combination of two or more of the listed items can be employed. For example, if a composition is described as containing components A, B, and/or C, the composition can contain A alone; B alone; C alone; A and B in combination; A and C in combination; B and C in combination; or A, B, and C in combination.

In this document, relational terms, such as first and second, top and bottom, and the like, are used solely to distinguish one entity or action from another entity or action, without necessarily requiring or implying any actual such relationship or order between such entities or actions.

Referring to FIGS. **1**A-**1**C, various exemplary embodiments of photoluminescent structures **10** are shown, each capable of being coupled to a substrate **12**, which may correspond to a vehicle fixture or vehicle-related piece of equipment. In FIG. **1**A, the photoluminescent structure **10** is generally shown rendered as a coating (e.g., a film) that may be applied to a surface of the substrate **12**. In FIG. **1**B, the photoluminescent structure **10** is generally shown as a discrete particle capable of being integrated with a substrate **12**. In FIG. **1**C, the photoluminescent structure **10** is generally shown as a plurality of discrete particles that may be incorporated into a support medium **14** (e.g., a film) that may then be applied (as shown) or integrated with the substrate **12**.

At the most basic level, a given photoluminescent structure **10** includes an energy conversion layer **16** that may include one or more sublayers, which are exemplarily shown through broken lines in FIGS. **1**A and **1**B. Each sublayer of the energy conversion layer **16** may include one or more photoluminescent materials **18** having energy converting elements with phosphorescent or fluorescent properties. Each photoluminescent material **18** may become excited upon receiving an excitation light **24** of a specific wavelength, thereby causing the light to undergo a conversion process. Under the principle of down conversion, the excitation light **24** is converted into a longer wavelength, converted light **26**, that is outputted from the photoluminescent structure **10**. Conversely, under the principle of up conversion, the excitation light **24** is converted into a shorter wavelength light that is outputted from the photoluminescent structure **10**. When multiple distinct wavelengths of light are outputted from the photoluminescent structure **10** at the same time, the wavelengths of light may mix together and be expressed as a multicolor light.

Light emitted by the sun, ambient sources and/or a light source is referred to herein as excitation light **24** and is illustrated herein as solid arrows. In contrast, light emitted from the photoluminescent structure **10** is referred to herein as converted light **26** and is illustrated herein as broken arrows. The mixture of excitation light **24** and converted light **26** that may be emitted simultaneously is referred to herein as outputted light.

The energy conversion layer **16** may be prepared by dispersing the photoluminescent material **18** in a polymer matrix to form a homogenous mixture using a variety of

methods. Such methods may include preparing the energy conversion layer **16** from a formulation in a liquid carrier support medium **14** and coating the energy conversion layer **16** to a desired substrate **12**. The energy conversion layer **16** may be applied to a substrate **12** by painting, screen-printing, spraying, slot coating, dip coating, roller coating, and bar coating. Alternatively, the energy conversion layer **16** may be prepared by methods that do not use a liquid carrier support medium **14**. For example, the energy conversion layer **16** may be rendered by dispersing the photoluminescent material **18** into a solid-state solution (homogenous mixture in a dry state) that may be incorporated in a polymer matrix, which may be formed by extrusion, injection molding, compression molding, calendaring, thermoforming, etc. The energy conversion layer **16** may then be integrated into a substrate **12** using any methods known to those skilled in the art. When the energy conversion layer **16** includes sublayers, each sublayer may be sequentially coated to form the energy conversion layer **16**. Alternatively, the sublayers can be separately prepared and later laminated or embossed together to form the energy conversion layer **16**. Alternatively still, the energy conversion layer **16** may be formed by coextruding the sublayers.

In some examples, the converted light **26** that has been down converted or up converted may be used to excite other photoluminescent material(s) **18** found in the energy conversion layer **16**. The process of using the converted light **26** outputted from one photoluminescent material **18** to excite another, and so on, is generally known as an energy cascade and may serve as an alternative for achieving various color expressions. With respect to either conversion principle, the difference in wavelength between the excitation light **24** and the converted light **26** is known as the Stokes shift and serves as the principle driving mechanism for an energy conversion process corresponding to a change in wavelength of light. In the various embodiments discussed herein, each of the photoluminescent structures **10** may operate under either conversion principle.

Referring back to FIGS. **1**A and **1**B, the photoluminescent structure **10** may optionally include at least one stability layer **20** to protect the photoluminescent material **18** contained within the energy conversion layer **16** from photolytic and thermal degradation. The stability layer **20** may be configured as a separate layer optically coupled and adhered to the energy conversion layer **16**. Alternatively, the stability layer **20** may be integrated with the energy conversion layer **16**. The photoluminescent structure **10** may also optionally include a protective layer **22** optically coupled and adhered to the stability layer **20** or other layer (e.g., the conversion layer **16** in the absence of the stability layer **20**) to protect the photoluminescent structure **10** from physical and chemical damage arising from environmental exposure. The stability layer **20** and/or the protective layer **22** may be combined with the energy conversion layer **16** through sequential coating or printing of each layer, sequential lamination or embossing, or any other suitable means.

Additional information regarding the construction of photoluminescent structures **10** is disclosed in U.S. Pat. No. 8,232,533 to Kingsley et al., entitled "PHOTOLYTICALLY AND ENVIRONMENTALLY STABLE MULTILAYER STRUCTURE FOR HIGH EFFICIENCY ELECTROMAGNETIC ENERGY CONVERSION AND SUSTAINED SECONDARY EMISSION," the entire disclosure of which is incorporated herein by reference. For additional information regarding fabrication and utilization of photoluminescent materials to achieve various light emissions, refer to U.S. Pat. No. 8,207,511 to Bortz et al., entitled "PHOTOLUMINESCENT FIBERS, COMPOSITIONS AND FABRICS MADE THEREFROM"; U.S. Pat. No. 8,247,761 to Agrawal et al., entitled "PHOTOLUMINESCENT MARKINGS WITH FUNCTIONAL OVERLAYERS"; U.S. Pat. No. 8,519,359 to Kingsley et al., entitled "PHOTOLYTICALLY AND ENVIRONMENTALLY STABLE MULTILAYER STRUCTURE FOR HIGH EFFICIENCY ELECTROMAGNETIC ENERGY CONVERSION AND SUSTAINED SECONDARY EMISSION"; U.S. Pat. No. 8,664,624 to Kingsley et al., entitled "ILLUMINATION DELIVERY SYSTEM FOR GENERATING SUSTAINED SECONDARY EMISSION"; U.S. Patent Publication No. 2012/0183677 to Agrawal et al., entitled "PHOTOLUMINESCENT COMPOSITIONS, METHODS OF MANUFACTURE AND NOVEL USES"; U.S. Pat. No. 9,057,021 to Kingsley et al., entitled "PHOTOLUMINESCENT OBJECTS"; and U.S. Pat. No. 8,846,184 to Agrawal et al., entitled "CHROMIC LUMINESCENT OBJECTS," all of which are incorporated herein by reference in their entirety.

According to one embodiment, the photoluminescent material **18** may include organic or inorganic fluorescent dyes including rylenes, xanthenes, porphyrins, and phthalocyanines. Additionally, or alternatively, the photoluminescent material **18** may include phosphors from the group of Ce-doped garnets such as YAG:Ce and may be a short persistence photoluminescent material **18**. For example, an emission by Ce^{3+} is based on an electronic energy transition from $4D^1$ to $4f^1$ as a parity allowed transition. As a result of this, a difference in energy between the light absorption and the light emission by Ce^{3+} is small, and the luminescent level of Ce^{3+} has an ultra-short lifespan, or decay time, of 10^{-8} to 10^{-7} seconds (10 to 100 nanoseconds). The decay time may be defined as the time between the end of excitation from the excitation light **24** and the moment when the light intensity of the converted light **26** emitted from the photoluminescent structure **10** drops below a minimum visibility of 0.32 mcd/m^2. A visibility of 0.32 mcd/m^2 is roughly 100 times the sensitivity of the dark-adapted human eye, which corresponds to a base level of illumination commonly used by persons of ordinary skill in the art.

According to one embodiment, a Ce^{3+} garnet may be utilized, which has a peak excitation spectrum that may reside in a shorter wavelength range than that of conventional YAG:Ce-type phosphors. Accordingly, Ce^{3+} has short persistence characteristics such that its decay time may be 100 milliseconds or less. Therefore, in some embodiments, the rare earth aluminum garnet type Ce phosphor may serve as the photoluminescent material **18** with ultra-short persistence characteristics, which can emit the converted light **26** by absorbing purple to blue excitation light **24** emitted from a light source and/or ambient sources. According to one embodiment, a ZnS:Ag phosphor may be used to create a blue converted light **26**. A ZnS:Cu phosphor may be utilized to create a yellowish-green converted light **26**. A Y_2O_2S:Eu phosphor may be used to create red converted light **26**. Moreover, the aforementioned phosphorescent materials may be combined to form a wide range of colors, including white light. It will be understood that any short persistence photoluminescent material known in the art may be utilized without departing from the teachings provided herein. Additional information regarding the production of short persistence photoluminescent materials is disclosed in U.S. Pat. No. 8,163,201 to Agrawal et al., entitled "PHOTOLYTICALLY AND ENVIRONMENTALLY STABLE MULTILAYER STRUCTURE FOR HIGH EFFICIENCY ELECTROMAGNETIC ENERGY CONVERSION AND

SUSTAINED SECONDARY EMISSION," the entire disclosure of which is incorporated herein by reference.

Additionally, or alternatively, the photoluminescent material **18**, according to one embodiment, disposed within the photoluminescent structure **10** may include a long persistence photoluminescent material **18** that emits the converted light **26**, once charged by the excitation light **24**. The excitation light **24** may be emitted from any excitation source (e.g., any natural light source, such as the sun, and/or any artificial light source). The long persistence photoluminescent material **18** may be defined as having a long decay time due to its ability to store the excitation light **24** and release the converted light **26** gradually, for a period of several minutes or hours, once the excitation light **24** is no longer present.

The long persistence photoluminescent material **18**, according to one embodiment, may be operable to emit light at or above an intensity of 0.32 mcd/m^2 after a period of 10 minutes. Additionally, the long persistence photoluminescent material **18** may be operable to emit light above or at an intensity of 0.32 mcd/m^2 after a period of 30 minutes and, in some embodiments, for a period substantially longer than 60 minutes (e.g., the period may extend 24 hours or longer, and in some instances, the period may extend 48 hours). Accordingly, the long persistence photoluminescent material **18** may continually illuminate in response to excitation from any light sources that emits the excitation light **24**, including, but not limited to, natural light sources (e.g., the sun) and/or any artificial light source. The periodic absorption of the excitation light **24** from any excitation source may provide for a substantially sustained charge of the long persistence photoluminescent material **18** to provide for consistent passive illumination. In some embodiments, a light sensor may monitor the illumination intensity of the photoluminescent structure **10** and actuate an excitation source when the illumination intensity falls below 0.32 mcd/m^2, or any other predefined intensity level.

The long persistence photoluminescent material **18** may correspond to alkaline earth aluminates and silicates, for example doped di-silicates, or any other compound that is capable of emitting light for a period of time once the excitation light **24** is no longer present. The long persistence photoluminescent material **18** may be doped with one or more ions, which may correspond to rare earth elements, for example, Eu^{2+}, Tb^{3+} and/or Dy^3. According to one non-limiting exemplary embodiment, the photoluminescent structure **10** includes a phosphorescent material in the range of about 30% to about 55%, a liquid carrier medium in the range of about 25% to about 55%, a polymeric resin in the range of about 15% to about 35%, a stabilizing additive in the range of about 0.25% to about 20%, and performance-enhancing additives in the range of about 0% to about 5%, each based on the weight of the formulation.

The photoluminescent structure **10**, according to one embodiment, may be a translucent white color, and in some instances reflective, when unilluminated. Once the photoluminescent structure **10** receives the excitation light **24** of a particular wavelength, the photoluminescent structure **10** may emit any color light (e.g., blue or red) therefrom at any desired brightness. According to one embodiment, a blue-emitting phosphorescent material may have the structure Li_2ZnGeO_4 and may be prepared by a high temperature solid-state reaction method or through any other practicable method and/or process. The afterglow may last for a duration of 2-8 hours and may originate from the excitation light **24** and d-d transitions of Mn^{2+} ions.

According to an alternate non-limiting exemplary embodiment, 100 parts of a commercial solvent-borne polyurethane, such as Mace resin 107-268, having 50% solids polyurethane in toluene/isopropanol, 125 parts of a blue-green long persistence phosphor, such as Performance Indicator PI-BG20, and 12.5 parts of a dye solution containing 0.1% Lumogen Yellow F083 in dioxolane may be blended to yield a low rare earth mineral photoluminescent structure **10**. It will be understood that the compositions provided herein are non-limiting examples. Thus, any phosphor known in the art may be utilized within the photoluminescent structure **10** without departing from the teachings provided herein. Moreover, it is contemplated that any long persistence phosphor known in the art may also be utilized without departing from the teachings provided herein.

Additional information regarding the production of long persistence photoluminescent materials is disclosed in U.S. Pat. No. 8,163,201 to Agrawal et al., entitled "HIGH-INTENSITY, PERSISTENT PHOTOLUMINESCENT FORMULATIONS AND OBJECTS, AND METHODS FOR CREATING THE SAME," the entire disclosure of which is incorporated herein by reference. For additional information regarding long persistence phosphorescent structures, refer to U.S. Pat. No. 6,953,536 to Yen et al., entitled "LONG PERSISTENT PHOSPHORS AND PERSISTENT ENERGY TRANSFER TECHNIQUE"; U.S. Pat. No. 6,117,362 to Yen et al., entitled "LONG-PERSISTENT BLUE PHOSPHORS"; and U.S. Pat. No. 8,952,341 to Kingsley et al., entitled "LOW RARE EARTH MINERAL PHOTOLUMINESCENT COMPOSITIONS AND STRUCTURES FOR GENERATING LONG-PERSISTENT LUMINESCENCE," all of which are incorporated herein by reference in their entirety.

Referring now to FIGS. **2-5**, a vehicle **40**, is depicted including a side mirror **44** positioned on an A-pillar **48**. A light assembly **52** is coupled with the side mirror **44**. The light assembly **52** is configured to illuminate a plurality of photoluminescent structures **10** located within an interior **40**A and on an exterior **40**B of the vehicle **40** when the vehicle **40** is in a doors off configuration. The vehicle **40** may further include an interior side marker **56** positioned on a seat assembly **60**. An exterior side marker **64** may be positioned on an exterior surface **68**A of a door **68**. The light assembly **52** may be configured to illuminate the interior and exterior side markers **56**, **64**.

Referring now to FIGS. **2-4**, the vehicle **40** is depicted in a "doors on" configuration. The vehicle **40** is capable of operation in the doors on configuration (FIGS. **2** and **3**) and a "doors off" configuration (FIG. **4**). In the doors on configuration, the vehicle **40** includes a plurality of doors **68** (e.g., driver and passenger doors) positioned around the vehicle **40** enclosing an interior **40**A, or passenger cabin, of the vehicle **40**. The doors **68** are operable between a closed position (FIG. **2**) and an open position (FIG. **4**). In essence, the vehicle **40** may be operated in a doors on configuration with the doors **68** attached to a frame of the vehicle **40**. In the doors off configuration, one or more of the doors **68** may be removed prior to operation (e.g., driving) of the vehicle **40** such that increased ventilation and/or a desired aesthetic appeal of the vehicle **40** is achieved. It will be understood that although shown in relation to a front passenger portion of the vehicle **40**, the disclosure provided below may equally be applied to a rear passenger portions of the vehicle **40** as well as a passenger side of the vehicle **40**.

The seat assembly **60** may be positioned within the interior **40**A of the vehicle **40**. The seat assembly **60** includes a seatback **80** and a seat base **84**. According to various

examples, the seatback **80** may be operably coupled with the seat base **84** and configured to pivot relative to the seat base **84**. The seat assembly **60** may be a single, or bucket, seat or may be a multi-person, or bench, seat. In bench seat examples, the seat assembly **60** may include a plurality of seatbacks **80** and a single seat base **84**. The seat base **84** may define an outboard surface **84**A proximate the doors **68** of the vehicle **40**. For purposes of this disclosure, the term outboard may mean outward, or away from a center of the vehicle **40** while the term inboard may mean toward, or proximate a center of the vehicle **40**.

The side mirror **44** may be positioned on the "A" pillar **48** of the vehicle **40**. In the depicted example, the side mirror **44** is coupled, or positioned, proximate a center of the A-pillar **48**, but it will be understood that the side mirror **44** may be coupled toward a base or a top of the A pillar **48**. According to various examples, the side mirror **44** may be pivotable (e.g., to adjust viewing and/or light emission patterns) relative to the A-pillar **48**. In examples where the side mirror **44** is coupled to the A-pillar **48**, the side mirror **44** may not be coupled to the door **68**. As such, the side mirror **44** may not move when the door **68** is transitioned between the open and closed positions. Further, when the vehicle **40** is in the doors off configuration, the side mirror **44** remains coupled with the vehicle **40**.

The light assembly **52** is coupled with the side mirror **44**. As such, the light assembly **52** may remain operable, and coupled with the vehicle **40**, in both the doors on and doors off configurations of the vehicle **40**. In the depicted example, the light assembly **52** is coupled with a bottom surface **44**A of the side mirror **44**, but it will be understood that the light assembly **52** may be positioned on a top and/or sides (e.g., vehicle forward, inboard, outboard and/or vehicle rearward) of the side mirror **44** without departing from the teachings provided herein. The light assembly **52** may include a plurality of light sources. The light sources may be configured to emit visible (e.g., white and/or colored) light, as well as non-visible light (e.g., infrared, near-infrared, ultraviolet and/or the excitation light **24**). The light sources may be light-emitting diodes, incandescent bulbs, electroluminescent devices and/or other types of devices capable of emitting electromagnetic radiation. The light assembly **52** may include a single light source or a plurality of light sources. For example, the light assembly **52** may include between 1 and about 10 light sources. In a specific example, the light assembly **52** may include 6 light sources. Each of the light sources may illuminate or excite a different region (e.g., photoluminescent structure **10**, or area) of the vehicle **40**. As such, each of the light sources may be configured to emit a different color or wavelength band of light based on the location it illuminates. The light sources of the light assembly **52** may emit light into the interior **40**A of the vehicle **40** as well as onto an exterior **40**B of the vehicle **40**. As will be explained in greater detail below, the light assembly **52** may provide a plurality of illuminations to both the interior and exterior **40**A, **40**B of the vehicle **40**. For example, the light assembly **52** may illuminate the plurality of photoluminescent structures **10** positioned within the interior and exterior **40**A, **40**B of the vehicle **40**. For purposes of this disclosure, to illuminate may mean to provide the excitation light **24**, visible and/or non-visible light to a region or area of the vehicle **40**. In visible light illumination examples, the light assembly **52** may emit a puddle lamp **100** on a ground beneath the vehicle **40** and/or may emit a map lamp **104** on the seat assembly **60** within the interior **40**A of the vehicle **40**. The map lamp **104** may be shown on to the seat base **84** such that the map lamp **104** is proximate or below a belt line of an occupant of the seat assembly **60**. It will be understood that the puddle lamp **100** and map lamp **104** may be emitted regardless of whether the door **68** is in the open or closed position or the vehicle **40** is in the doors on or doors off configuration.

Referring now to FIG. **2**, the exterior side marker **64** is positioned on an exterior surface **68**A of the door **68**. In the depicted example, the exterior side marker **64** is shown as extending across the exterior surface **68**A of the door **68**, but it will be understood that the exterior side marker **64** may extend across only a portion of the exterior surface **68**A. The exterior side marker **64** may be positioned at a bottom, middle or top of the door **68** or any location therebetween. It will be understood that the exterior side marker **64** may extend onto a B-pillar **112** and/or onto other doors **68** without departing from the teachings provided herein. The exterior side marker **64** is depicted as a single, unitary, structure, but it will be understood that the marker **64** may be composed of a plurality of smaller markers, each of the same, or varying, size. Further, the vehicle **40** and/or door **68** may include a plurality of exterior side markers **64**. According to at least one example, the exterior side marker **64** may be painted onto the exterior surface **68**A of the door **68**. According yet other examples, the exterior side marker **64** may be part of a sticker which is adhered to the exterior surface **68**A of the door **68**.

According to various examples, the exterior side marker **64** may include the photoluminescent structure **10**. As such, illumination of the exterior side marker **64** by the light assembly **52** may excite the marker **64** into emitting visible light (e.g., the converted light **26**). The illumination by the light assembly **52** may further function to charge (e.g., in persistent phosphor examples) the exterior side marker **64** such that the marker **64** emits light over a sustained period of time without constant and/or continual illumination by the light assembly **52**. It will be understood that the exterior side marker **64** may further be charged, or caused to emit light, from ambient lighting (e.g., the sun, moon, street lamps, etc.) and/or illumination (e.g., head lights) from other vehicles. Further, the exterior side marker **64** may be charged while door **68** is in either the open or closed positions and even while the door **68** is removed from the vehicle **40**. The exterior side marker **64** may include one or a plurality of reflective elements which may reflect visible and/or nonvisible light which may be advantageous in increasing the visibility of the vehicle **40**.

The exterior side marker **64** is configured to emit light outwardly and away from the vehicle **40**. The light emitted from the exterior side marker **64** may be a variety of colors based on the charging or excitation light **24** received from the light assembly **52**. For example, the exterior side marker **64** may be configured to glow, or emit, amber colored light while the vehicle **40** is in motion (e.g., driving). In another example, the exterior side marker **64** may be configured to emit white or colored light while the vehicle **40** is not in motion (e.g., parked). Further, the light emitted from the exterior side marker **64** may take a variety of other colors which may provide an aesthetically pleasing appearance to the vehicle **40** (e.g., based on predefined user preferences or color schemes of the vehicle **40**).

Use of the exterior side marker **64** may be advantageous in increasing a visibility of the vehicle **40** under low lighting conditions. For example, illumination of the exterior side marker **64** may not only cause the marker **64** to immediately emit light, but may also charge the marker **64** to sustain a predefined, or desired, luminance for an extended period of time. Further, incorporation of one or more reflective ele-

ments into the exterior side marker **64** may provide a passive illumination which may increase the visibility of the vehicle **40**.

A badge **120** is positioned on a front quarter panel **124** of the vehicle **40**. It will be understood that the vehicle **40** may include one or a plurality of badges **120**. Further, the badge **120** may additionally be positioned on the door **68** of the vehicle **40**. The badge **120** may be an indicium configured to convey information on lookers of the vehicle **40** relating to the make, model, styling or trim package of the vehicle **40**. Additionally or alternatively, the badge **120** may simply be a decorative or aesthetic styling.

According to various examples, the badge **120** may include the photoluminescent structure **10**. As such, illumination of the badge **120** by the light assembly **52** may excite the badge **120** into emitting visible light. The illumination of the badge **120** by the light assembly **52** may further function to charge (e.g., in persistent phosphor examples) the badge **120** such that the badge **120** emits light over a sustained period of time without constant and/or continual illumination by the light assembly **52**. It will be understood that the badge **120** may further be charged, or caused to emit light, from ambient lighting (e.g., the sun, moon, street lamps, etc.) and/or illumination (e.g., head lights) from other vehicles. Further, the badge **120** may be charged while door **68** is in either the open or closed positions and even while the door **68** is removed from the vehicle **40**.

The badge **120** is configured to emit light outwardly and away from the vehicle **40**. The light emitted from the badge **120** may be a variety of colors based on the charging or excitation light **24** received from the light assembly **52**. For example, exterior side marker **64** may be configured to glow, or emit, white or colored light which may provide an aesthetically pleasing appearance to the vehicle **40** (e.g., based on predefined user preferences or color schemes of the vehicle **40**).

Referring now to FIG. **3**, a door open indicator **130** is positioned on an interior surface **68**B of the door **68**. In the depicted example, the door open indicator **130** is shown as extending across the interior surface **68**B of the door **68**, but it will be understood that the door open indicator **130** may extend across only a portion of the interior surface **68**B. The door open indicator **130** may be positioned at a bottom, middle or top of the door **68** or any location therebetween. It will be understood that the door open indicator **130** may be positioned on other doors **68** without departing from the teachings provided herein. The door open indicator **130** is depicted as a single, unitary, structure, but it will be understood that the door open indicator **130** may be composed of a plurality of smaller markers, each of the same, or varying, size. According to at least one example, the door open indicator **130** may be painted onto the interior surface **68**B of the door **68**. According to yet other examples, the door open indicator **130** may be part of a sticker which is adhered to the interior surface **68**B of the door **68**.

According to various examples, the door open indicator **130** may include the photoluminescent structure **10**. As such, illumination of the door open indicator **130** by the light assembly **52** may excite the indicator **130** into emitting visible light. The illumination by the light assembly **52** may further function to charge (e.g., in persistent phosphor examples) the door open indicator **130** such that the indicator **130** emits light over a sustained period of time without constant and/or continual illumination by the light assembly **52**. It will be understood that the door open indicator **130** may further be charged, or caused to emit light, from ambient lighting (e.g., the sun, moon, street lamps, etc.) and/or illumination (e.g., head lights) from other vehicles. The door open indicator **130** may be charged by the light assembly **52** while door **68** is in the open position and/or even while the door **68** is removed from the vehicle **40**. The door open indicator **130** may include one or a plurality of reflective elements which may reflect visible and/or nonvisible light which may increase visibility of the vehicle **40** while the door **68** is in the open position.

The door open indicator **130** is configured to emit light outwardly and rearwardly from the vehicle **40**. The light emitted from the door open indicator **130** may be a variety of colors based on the charging or excitation light **24** received from the light assembly **52**. For example, exterior side marker **64** may be configured to glow, or emit, red and/or white colored light. In another example, the door open indicator **130** may be configured to emit a colored light while the vehicle **40** is not in motion (e.g., parked). Further, the light emitted from the door open indicator **130** may take a variety of other colors which may provide an aesthetically pleasing appearance to the vehicle **40** (e.g., based on predefined user preferences or color schemes of the vehicle **40**).

Use of the door open indicator **130** may be advantageous in increasing a visibility of the vehicle **40** under low lighting conditions. Further, the door open indicator **130** may provide a large and illuminated area allowing passing vehicles to quickly identify that the door **68** of the vehicle **40** is in the open position. For example, illumination of the door open indicator **130** may not only cause the indicator **130** to immediately emit light, but may also charge the indicator **130** to sustain a desired luminance for an extended period of time. Further, incorporation of one or more reflective elements into the door open indicator **130** may provide a passive illumination which may increase the visibility of the open door **68** of the vehicle **40**.

Referring now to FIG. **4**, the vehicle **40** is depicted in the doors off configuration. In such an example, the exterior side marker **64** (FIG. **2**) may be removed from the vehicle **40** such that the interior side marker **56** and an auxiliary side marker **140** are desirable to increase the visibility of the vehicle **40**.

The interior side marker **56** is positioned on the seat assembly **60**. In the depicted example, the interior side marker **56** is positioned on the seat base **84**, but it will be understood that the interior side marker **56** may additionally or alternatively be positioned on the seatback **88**. The interior side marker **56** is positioned on the outboard surface **84**A of the seat base **84**. In the depicted example, the interior side marker **56** is shown as extending across the outboard surface **84**A of the seat base **84**, but it will be understood that the interior side marker **56** may extend across only a portion of the outboard surface **84**A. The interior side marker **56** may be positioned at a bottom, middle or top of the seat base **84** or any location therebetween. It will be understood that multiple seat assemblies **60** within the vehicle **40** may include the interior side marker **56** without departing from the teachings provided herein. The interior side marker **56** is depicted as a single, unitary, structure, but it will be understood that the marker **56** may be composed of a plurality of smaller markers, each of the same, or varying, size. Further, the vehicle **40** and/or seat base **84** may include a plurality of interior side markers **56**. According to at least one example, the interior side marker **56** may be painted onto, or incorporated into an upholstery of, the outboard surface **84**A of the seat base **84**. According to yet other examples, the interior side marker **56** may be part of a sticker which is adhered to the outboard surface **84**A of the seat base **84**.

According to various examples, the interior side marker **56** may include the photoluminescent structure **10**. As such, illumination of the interior side marker **56** by the light assembly **52** may excite the marker **56** into emitting visible light. The illumination by the light assembly **52** may further function to charge (e.g., in persistent phosphor examples) the interior side marker **56** such that the marker **56** emits light over a sustained period of time without constant and/or continual illumination by the light assembly **52**. It will be understood that the interior side marker **56** may further be charged, or caused to emit light, from ambient lighting (e.g., the sun, moon, street lamps, etc.) and/or illumination (e.g., head lights) from other vehicles. Further, the interior side marker **56** may be charged while the door **68** is in either the open or closed positions and even while the door **68** is removed from the vehicle **40**. The interior side marker **56** may include one or a plurality of reflective elements which may reflect visible and/or nonvisible light which may increase visibility of the vehicle **40**.

The interior side marker **56** is configured to emit light outwardly and away from the vehicle **40**. The light emitted from the interior side marker **56** may be a variety of colors based on the charging or excitation light **24** received from the light assembly **52**. For example, the interior side marker **56** may be configured to glow, or emit, amber colored light while the vehicle **40** is in motion (e.g., driving). In another example, the interior side marker **56** may be configured to emit white or colored light while the vehicle **40** is not in motion (e.g., parked). Further, the light emitted from the interior side marker **56** may take a variety of other colors which may provide an aesthetically pleasing appearance to the vehicle **40** (e.g., based on predefined user preferences or color schemes of the vehicle **40**).

Use of the interior side marker **56** may be advantageous in increasing a visibility of the vehicle **40** while the vehicle **40** is in the door off configuration. For example, with the doors **68** removed from the vehicle **40**, the interior side marker **56** is visible to other vehicles and designates a side of the vehicle **40**. Further, the interior side marker **56** may be visible while the door **68** is in the open position. Illumination of the interior side marker **56** may not only cause the marker **56** to immediately emit light, but may also charge the marker **56** to sustain a desired luminance for an extended period of time. Further, incorporation of one or more reflective elements into the interior side marker **56** may provide a passive illumination which may increase the visibility of the vehicle **40**. Even further, the interior side marker **56** may emit light while the door **68** is coupled to the vehicle **40** and in the closed position such that marker **56** provides an aesthetically pleasing ambient light to the interior **40**A of the vehicle **40**. In other words, the interior side marker **56** may be configured to reflect light off of the interior surface **68**B of the door **68** to provide ambient lighting to the interior **40**A of the vehicle **40**.

The auxiliary side marker **140** is positioned on a door sill **148** of the vehicle **40**. In the depicted example, the auxiliary side marker **140** is positioned along a bottom portion of the door sill **148**, but it will be understood that the auxiliary side marker **140** may additionally or alternatively extend around a majority or an entirety of the door sill **148**. In examples where only a portion of the door sill **148** is covered by the auxiliary side marker **140**, the auxiliary side marker **140** may be positioned on the bottom, sides or top of the door sill **148** or any location therebetween. It will be understood that the auxiliary side marker **140** may be positioned on any door sill **148** defined by the vehicle **40**. The auxiliary side marker **140** is depicted as a single, unitary, structure, but it will be understood that the marker **140** may be composed of a plurality of smaller markers, each of the same, or varying, size. Further, the vehicle **40** and/or door sill **148** may include a plurality of auxiliary side marker **140**. According to at least one example, the auxiliary side marker **140** may be painted onto the door sill **148**. According to yet other examples, the auxiliary side marker **140** may be part of a sticker which is adhered to the door sill **148**.

According to various examples, the auxiliary side marker **140** may include the photoluminescent structure **10**. As such, illumination of the auxiliary side marker **140** by the light assembly **52** may excite the marker **140** into emitting visible light. The illumination by the light assembly **52** may further function to charge (e.g., in persistent phosphor examples) the auxiliary side marker **140** such that the marker **140** emits light over a sustained period of time without constant and/or continual illumination by the light assembly **52**. It will be understood that the auxiliary side marker **140** may further be charged, or caused to emit light, from ambient lighting (e.g., the sun, moon, street lamps, etc.) and/or illumination (e.g., head lights) from other vehicles. Further, the auxiliary side marker **140** may be charged while the door **68** is in the open position and when the door **68** is removed from the vehicle **40**. The auxiliary side marker **140** may include one or a plurality of reflective elements which may reflect visible and/or nonvisible light which may increase visibility of the vehicle **40**.

The auxiliary side marker **140** is configured to emit light outwardly and away from the vehicle **40**. In examples where the auxiliary side marker **140** covers a majority and/or an entirety of the door sill **148**, lighting from the auxiliary side marker **140** may outline the door sill **148**. The light emitted from the auxiliary side marker **140** may be a variety of colors based on the charging or excitation light **24** received from the light assembly **52**. For example, the auxiliary side marker **140** may be configured to glow, or emit, amber colored light while the vehicle **40** is in motion (e.g., driving). In another example, the auxiliary side marker **140** may be configured to emit white or colored light while the vehicle **40** is not in motion (e.g., parked). Further, the light emitted from the auxiliary side marker **140** may take a variety of other colors which may provide an aesthetically pleasing appearance to the vehicle **40** (e.g., based on predefined user preferences or color schemes of the vehicle **40**).

Use of the auxiliary side marker **140** may be advantageous in increasing a visibility of the vehicle **40** while the vehicle **40** is in the door off configuration and/or while the door **68** is in the open position. For example, when the auxiliary side marker **140** is exposed (e.g., doors off or the door **68** is in the open position) the auxiliary side marker **140** is visible to other vehicles and designates a side of the vehicle **40**. Illumination of the auxiliary side marker **140** may not only cause the marker **140** to immediately emit light, but may also charge the marker **140** to sustain a desired luminance for an extended period of time. Further, incorporation of one or more reflective elements into the auxiliary side marker **140** may provide a passive illumination which may increase the visibility of the vehicle **40**.

An indicium **160** may be positioned on the seat assembly **60**. In the depicted example, the indicium **160** is positioned in a center of the seatback **80**, but it will be understood that the indicium **160** may be positioned anywhere on the seatback **80** and/or seat base **84**. Further, the indicium **160** may include a plurality of indicia. The indicium **160** may be configured to convey information to on lookers of the vehicle **40** relating to the make, model, styling or trim package of the vehicle **40**. Additionally or alternatively, the

indicium **160** may simply be a decorative or aesthetic styling. According to at least one example, the indicium **160** may be painted onto the seat assembly **60**. According to yet other examples, the indicium **160** may be part of a sticker which is adhered to the seat assembly **60**.

According to various examples, the indicium **160** may include the photoluminescent structure **10**. As such, illumination of the indicium **160** by the light assembly **52** may excite the indicium **160** into emitting visible light (e.g., colored or white). The illumination by the light assembly **52** may further function to charge (e.g., in persistent phosphor examples) the indicium **160** such that the indicium **160** emits light over a sustained period of time without constant and/or continual illumination by the light assembly **52**. It will be understood that the indicium **160** may further be charged, or caused to emit light, from ambient lighting (e.g., the sun, moon, street lamps, etc.) and/or illumination (e.g., head lights) from other vehicles. Further, the indicium **160** may be charged regardless of door position of door configuration of the vehicle **40**.

Referring now to FIG. **5**, depicted is a block diagram of the vehicle **40** in which the light assembly **52** is implemented. The vehicle **40** includes a controller **170** in communication with one or more vehicle control modules **174**. The vehicle control module **174** may be configured to relay information to the controller **170** from a variety of sensors. Exemplary sensors include a light sensor **178**, an ambient light sensor **182** (e.g., a day/night sensor) and a hinge sensor **186**. The light sensor **178** may be positioned within the A-pillar **48** (FIG. **4**) and configured to detect light emitted from at least one of the interior side marker **56**, exterior side marker **64**, badge **120**, door indicator **130**, auxiliary side marker **140** and/or indicium **160**. It will be understood that although described in connection with a single light sensor **178**, the vehicle **40** may include a plurality of light sensors **178**, each configured to detect a luminance value for a different region (e.g., side marker **56**, **64**, **140**, badge **120**, door indicator **130** and/or indicium **160**) of the vehicle **40**. The hinge sensor **186** may be configured to detect a hinge status (e.g., whether the door **68** is engaged or not engaged and/or in the open or closed position) of the vehicle **40** (e.g., indicating the doors on or doors off status of the vehicle **40**). Additionally or alternatively to the hinge sensor **186**, the presence or position of the door **68** may be determined based on a "roll call" to linear interconnect network modules in the door **68** (e.g., window switches and/or door lock switches).

The controller **170** may include a memory **190** having a light control routine **194** contained therein that is executed by a processor **198** of the controller **170**. The controller **170** may provide electrical power to the light assembly **52** via a power source **202** located onboard the vehicle **40**. In addition, the controller **170** may be configured to control the light emitted from the light assembly **52** based on feedback received from the vehicle control module **174**. The light control routine **194** may include a variety of routines configured to cause the controller **170** to vary the intensity, on/off status and/or color of the light emitted from the light assembly **52**.

In a first example, the light control routine **194** of the controller **170** may be configured to utilize input data from the ambient light sensor **182** to provide the puddle lamp **100** and/or the map lamp **104**. It will be understood that additionally or alternatively, the puddle lamp **100** and/or the map lamp **104** may be activated based on user preference (e.g., a switch) and/or other inputs. As explained above, positioning of the side mirror **44** on the A-pillar **48** allows the light assembly **52** to provide the puddle lamp **100** and/or the map lamp **104** regardless of the position of the door **68** and/or door configuration of the vehicle **40**. The puddle lamp **100** may be activated when the vehicle **40** detects (e.g., ultrasonic, Bluetooth, etc.) the approach of a user of the vehicle **40** and/or when the controller **170** anticipates (e.g., via hinge status) that an occupant of the vehicle **40** is about to exit the vehicle **40**. In other words, the puddle lamp **100** and/or the map lamp **104** may be activated in conjunction with a "welcome" or "farewell" light routine of the vehicle **40**.

In a second example, the light control routine **194** may control the light assembly **52** to illuminate the exterior side marker **64** when the controller **170** detects that the vehicle **40** is in the doors on configuration (e.g., through the hinge sensor **186**). It will be understood that the activation of the light assembly **52** to illuminate the exterior side marker **64** may additionally be based on input from the ambient light sensor **182** (i.e., indicating night time and that the exterior side markers **64** should be illuminated for greater visibility). The color of light emitted from the exterior side marker **64** may be controlled based on the driving status (e.g., driving, parked, etc.) of the vehicle **40**.

In a third example, the light control routine **194** may control the light assembly **52** to illuminate the interior side marker **56** and/or auxiliary side marker **140** when the controller **170** detects that the vehicle **40** is in the doors off configuration (e.g., through the hinge sensor **186**). It will be understood that the activation of the light assembly **52** to illuminate the interior side marker **56** and/or auxiliary side marker **140** may additionally be based on input from the ambient light sensor **182** (i.e., indicating night time and that the interior side markers **56** should be illuminated for greater visibility).

In a fourth example, the light control routine **194** may control the light assembly **52** to illuminate the door indicator **130** when the controller **170** detects that the door **68** is in the open position. Illumination of the door indicator **130**, while the door **68** is in the open position, may be advantageous in alerting other vehicles to the open position of the door **68** which may increase safety of the vehicle **40**. It will be understood that the interior side marker **56** and/or the auxiliary side marker **140** may be illuminated while the door indicator **130** is illuminated to increase visibility of the vehicle **40**.

In a fifth example, the light sensor **178** may detect a luminance from any of the side markers **56**, **64**, **140**, badge **120**, door indicator **130** and/or indicium **160** and determine if the luminance value falls below a predefined threshold. In such an example, the light control routine **194** may be configured to pulse or flash the light assembly **52** to charge any of the side markers **56**, **64**, **140**, badge **120**, door indicator **130** and/or indicium **160** such that the luminance measured by the light sensor **178** meets or exceeds the predefined value.

In a sixth example, the light control routine **194** may be configured to flash or otherwise indicate to an occupant of the vehicle **40** that the door **68** has been removed and/or is not correctly attached.

It will be understood that the light control routine **194** may perform any or all of the above noted examples, simultaneously or in sequence, without departing from the teachings provided herein.

Use of the present disclosure may offer a variety of advantages. First, as the side mirror **44** is coupled to the A-pillar **48**, the mirror **44** and the light assembly **52** may remain in substantially the same position regardless of door position or door configuration of the vehicle **40**. As the side mirror **44** and the light assembly **52** remain attached to the

vehicle **40**, the light assembly **52** may illuminate a plurality of locations regardless of the doors on and doors off configurations. Second, the side mirror **44** may provide the puddle lamp **100** regardless of door position and door configuration of the vehicle **40**. Third, photoluminescent structure **10** examples of the side markers **56**, **64**, **140**, badge **120**, door indicator **130** and/or indicium **160** may allow the light assembly **52** to run for only a short period of time to illuminate (e.g., charge) the structures **10** thereby decreasing energy usage of the vehicle **40**. Further, by using photoluminescent structures **10** in the side markers **56**, **64**, **140**, badge **120**, door indicator **130** and/or indicium **160**, passive charging (e.g., which may reduce power consumption) from ambient light sources may be achieved. Fourth, use of the auxiliary side marker **140** may further allow a user of the vehicle **40** to enter and exit the vehicle **40** in a safe manner in low lighting conditions because the marker **140** illuminates at least a portion of the door sill **148**. Fifth, the map lamp **104** provided by the light assembly **52** may be utilized regardless of door position or door configuration of the vehicle **40**. Further, as the map lamp **104** is provided on the seat base **84** (e.g., proximate or below a belt level of an occupant of the seat assembly **60**), the map lamp **104** may cause less driver distraction and provide a more aesthetically pleasing illumination. Sixth, use of the door indicator **130** may replace the use of traditional red passive reflectors attached to door **68**. The light emitted from the door indicator **130** may provide enhanced visibility, and therefore safety, while the door **68** is in the open position. Seventh, the indicium **160** may provide an aesthetically pleasing design which may be readily viewed by occupants of the vehicle **40** as well as people exterior to the vehicle **40** (e.g., in either the door on or doors off configuration).

According to various examples, a vehicle is provided herein including a side mirror positioned on an A-pillar. A light assembly is coupled with a bottom surface of the side mirror. The light assembly is configured to illuminate a plurality of photoluminescent structures located within an interior and on an exterior of the vehicle when the vehicle is in a doors off configuration. Examples of the vehicle can include any one or a combination of the following features:

- at least one of the photoluminescent structures comprises an interior side marker positioned on a seat assembly;
- the interior side marker is positioned on a seat base of the seat assembly;
- the interior side marker is positioned on an outboard surface of the seat base;
- at least one of the photoluminescent structures comprises a badge positioned on an exterior of the vehicle;
- at least one of the photoluminescent structures comprises an auxiliary side marker positioned on a door sill;
- at least one of the photoluminescent structures comprises a phosphorescent material.
- the light assembly is further configured to emit a puddle lamp on a ground beneath the vehicle;
- the light assembly is further configured to illuminate an open door indicator positioned on an interior surface of a door; and/or
- the photoluminescent structures are configure to emit light toward an exterior of the vehicle.

Modifications of the disclosure will occur to those skilled in the art and to those who make or use the disclosure. Therefore, it is understood that the embodiments shown in the drawings and described above are merely for illustrative purposes and not intended to limit the scope of the disclosure, which is defined by the following claims, as interpreted according to the principles of patent law, including the doctrine of equivalents.

For purposes of this disclosure, the term "coupled" (in all of its forms: couple, coupling, coupled, etc.) generally means the joining of two components (electrical or mechanical) directly or indirectly to one another. Such joining may be stationary in nature or movable in nature. Such joining may be achieved with the two components (electrical or mechanical) and any additional intermediate members being integrally formed as a single unitary body with one another or with the two components. Such joining may be permanent in nature, or may be removable or releasable in nature, unless otherwise stated.

As used herein, the term "about" means that amounts, sizes, formulations, parameters, and other quantities and characteristics are not and need not be exact, but may be approximate and/or larger or smaller, as desired, reflecting tolerances, conversion factors, rounding off, measurement error and the like, and other factors known to those of skill in the art. When the term "about" is used in describing a value or an end-point of a range, the disclosure should be understood to include the specific value or end-point referred to. Whether or not a numerical value or end-point of a range in the specification recites "about," the numerical value or end-point of a range is intended to include two embodiments: one modified by "about," and one not modified by "about." It will be further understood that the endpoints of each of the ranges are significant both in relation to the other endpoint, and independently of the other endpoint.

The terms "substantial," "substantially," and variations thereof as used herein are intended to note that a described feature is equal or approximately equal to a value or description. For example, a "substantially planar" surface is intended to denote a surface that is planar or approximately planar. Moreover, "substantially" is intended to denote that two values are equal or approximately equal. In some embodiments, "substantially" may denote values within about 10% of each other, such as within about 5% of each other, or within about 2% of each other.

As used herein the terms "the," "a," or "an," mean "at least one," and should not be limited to "only one" unless explicitly indicated to the contrary. Thus, for example, reference to "a component" includes embodiments having two or more such components unless the context clearly indicates otherwise.

It will be apparent to those skilled in the art that various modifications and variations can be made to the present disclosure without departing from the spirit and scope of the disclosure. Thus, it is intended that the present disclosure cover such modifications and variations provided they come within the scope of the appended claims and their equivalents. Example embodiments include the following.

What is claimed is:

1. A vehicle, comprising:

a plurality of photoluminescent structures located within an interior and on an exterior of the vehicle;

a side mirror positioned on the exterior of the vehicle on an A-pillar; and

a light assembly coupled with a bottom surface of the side mirror, wherein the light assembly is configured to illuminate the plurality of photoluminescent structures when the vehicle is in a doors off configuration.

2. The vehicle of claim **1**, wherein at least one of the photoluminescent structures comprises an interior side marker positioned on a seat assembly.

3. The vehicle of claim 2, wherein the interior side marker is positioned on a seat base of the seat assembly.

4. The vehicle of claim 3, wherein the interior side marker is positioned on an outboard surface of the seat base.

5. The vehicle of claim 1, wherein at least one of the photoluminescent structures comprises a badge positioned on an exterior of the vehicle.

6. The vehicle of claim 1, wherein at least one of the photoluminescent structures comprises an auxiliary side marker positioned on a door sill.

7. The vehicle of claim 1, wherein at least one of the photoluminescent structures comprises a phosphorescent material.

8. The vehicle of claim 1, wherein the light assembly is further configured to emit a puddle lamp on a ground beneath the vehicle.

9. The vehicle of claim 1, wherein the light assembly is further configured to illuminate an open door indicator positioned on an interior surface of a door.

10. A vehicle, comprising:

an exterior side mirror positioned on an A-pillar;

a light assembly coupled to the exterior side mirror;

an interior side marker positioned on a seat assembly; and

an exterior side marker positioned on an external surface of a door, wherein the light assembly is configured to illuminate the interior and exterior side markers.

11. The vehicle of claim 10, wherein the interior side marker is positioned on an outboard surface of the seat assembly.

12. The vehicle of claim 11, wherein the interior side marker is positioned on the outboard surface of a seat base of the seat assembly.

13. The vehicle of claim 10, wherein at least one of the interior and exterior side markers comprises a photoluminescent structure.

14. The vehicle of claim 10, further comprising:

an auxiliary side marker positioned on a door sill.

15. A vehicle, comprising:

an exterior side mirror positioned on an A-pillar;

a light assembly coupled to the exterior side mirror; and

a door positioned proximate the exterior side mirror operable between closed and open positions, wherein the light assembly is configured to illuminate photoluminescent structures positioned on a seat assembly and an inner surface of the door.

16. The vehicle of claim 15, wherein the light assembly is further configured to illuminate a badge located on an exterior of the vehicle while the door is in the open position.

17. The vehicle of claim 16, wherein the light assembly is further configured to emit a puddle lamp on a ground beneath the vehicle while the door is in the open position.

18. The vehicle of claim 17, further comprising:

an auxiliary side marker positioned on a door sill.

19. The vehicle of claim 18, wherein the auxiliary side marker comprises a photoluminescent structure.

20. The vehicle of claim 19, wherein the photoluminescent structures are configured to emit light toward an exterior of the vehicle.

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