Claims

1. A light concentrator comprising:

   a polymeric matrix with embedded luminophores; and

   a wavelength-selective structure such that the polymeric matrix is within a cavity defined by the wavelength-selective structure;

   wherein the wavelength-selective structure is configured to substantially allow external light of a predetermined wavelength or range of wavelengths incident onto the wavelength-selective structure at predetermined incident angles to pass through the wavelength-selective structure;

   wherein the luminophores are configured to absorb the external light of the predetermined wavelength or range of wavelengths that passes through the wavelength-selective structure, and further configured to emit wavelength-converted light of another predetermined wavelength or range of wavelengths upon absorption of the external light that passes through the wavelength-selective structure;

   wherein the wavelength-selective structure is further configured to substantially reflect the wavelength-converted light incident onto the wavelength-selective structure at further predetermined incident angles;

   wherein the wavelength-selective structure defines an opening configured to allow the wavelength-converted light or the reflected wavelength-converted light to pass through; and

   wherein the light concentrator also comprises a photodetector butt-coupled to the opening such that the wavelength-converted light or the reflected wavelength-converted light exits the opening to the photodetector to be detected.

2. The light concentrator according to claim 1,

   wherein the wavelength-selective structure is a Bragg reflector.

3. The light concentrator according to claim 2,

   wherein the Bragg reflector is a stacked arrangement comprising alternate layers of a first refractive index and layers of a second refractive index different from the first refractive index.

4. The light concentrator according to any one of claims 1 to 3,
wherein the luminophores comprise quantum dots.

5. The light concentrator according to claim 4,
wherein the quantum dots comprise copper indium sulfide, indium phosphide, or cadmium selenide.

6. The light concentrator according to claim 4 or claim 5,
wherein the quantum dots comprise a lead halide perovskite.

7. The light concentrator according to any one of claims 1 to 6,
wherein the luminophores comprise an organic dye.

8. The light concentrator according to any one of claims 1 to 7,
wherein the luminophores comprise perovskites.

9. The light concentrator according to any one of claims 1 to 8,
wherein the luminophores comprise lanthanides.

10. The light concentrator according to any one of claims 1 to 9,
wherein the wavelength-selective structure forms a coating on a surface of the polymeric matrix; and
wherein the opening is an uncoated part of the surface of the polymeric matrix.

11. The light concentrator according to any one of claims 1 to 10,
wherein the polymeric matrix comprises an epoxy or an acrylate.

12. The light concentrator according to any one of claims 1 to 11,
wherein the polymeric matrix is of a shape selected from a group consisting of a cube, a prism, a cylinder, a sheet, and a fiber.

13. The light according to any one of claims 1 to 12,
wherein the external light is omnidirectional light.

14. A method of forming a light concentrator, the method comprising:

forming a polymeric matrix with embedded luminophores; and

forming a wavelength-selective structure such that the polymeric matrix is within a cavity defined by the wavelength-selective structure;

wherein the wavelength-selective structure is configured to substantially allow external light of a predetermined wavelength or range of wavelengths incident onto the wavelength-selective structure at predetermined incident angles to pass through the wavelength-selective structure;

wherein the luminophores are configured to absorb the external light of the predetermined wavelength or range of wavelengths that passes through the wavelength-selective structure, and further configured to emit wavelength-converted light of another predetermined wavelength or range of wavelengths upon absorption of the external light that passes through the wavelength-selective structure;

wherein the wavelength-selective structure is further configured to substantially reflect the wavelength-converted light incident onto the wavelength-selective structure at further predetermined incident angles;

wherein the wavelength-selective structure defines an opening configured to allow the wavelength-converted light or the reflected wavelength-converted light to pass through; and

wherein the method also comprises providing a photodetector butt-coupled to the opening such that the wavelength-converted light or the reflected wavelength-converted light exits the opening to the photodetector to be detected.

15. The method according to claim 14,

wherein forming the polymeric matrix with embedded luminophores comprises mixing a polymeric resin precursor and the luminescent particles to form a mixture; and

wherein forming the polymeric matrix with embedded luminophores further comprises providing the mixture in a mold such that the mixture is allowed to be cured, thereby forming the polymeric matrix with embedded luminophores.

16. The method according to claim 15,

wherein forming the polymeric matrix with embedded luminescent particles comprises removing any excess solvent and air bubbles from the mixture prior to providing the mixture in the mold.

17. The method according to claim 15 or claim 16,

wherein the mixture has a viscosity of less than 1000 cP.

18. The method according to any one of claims 14 to 17,

wherein forming the wavelength-selective structure comprises applying or coating the polymeric matrix with alternate layers of a first refractive index and layers of a second refractive index different from the first refractive index.

19. The method according to any one of claims 14 to 18,

wherein the polymeric matrix is of a shape selected from a group consisting of a cube, a prism, a cylinder, a sheet, and a fiber.