Claims

1. A light concentrator comprising:

    a matrix comprising:

        a matrix material;

        a plurality of luminophores in the matrix; and

        a plurality of optical scatterers in the matrix; and

    a Bragg reflector layer in contact with an outer surface of the matrix, the Bragg reflector layer defining an opening.

2. The light concentrator according to claim 1,

    wherein the plurality of luminophores is configured to absorb incident light of a predetermined wavelength or range of wavelengths, and further configured to emit wavelength-converted light of another predetermined wavelength or range of wavelengths upon absorption of the incident light;

    wherein the plurality of optical scatterers is configured to scatter the incident light and the wavelength-converted light;

    wherein the Bragg reflector layer is configured to allow a fraction of the incident light traveling from outside the light concentrator to pass through to the matrix, and is further configured to reflect a fraction of the wavelength-converted light traveling from the matrix towards outside the light concentrator back to the matrix; and

    wherein the opening is configured to allow the wavelength-converted light to pass through.

3. The light concentrator according to claim 2,

    wherein the other predetermined wavelength or range of wavelengths is longer than the predetermined wavelength or range of wavelengths.

4. The light concentrator according to claim 2,

    wherein the other predetermined wavelength or range of wavelengths is shorter than the predetermined wavelength or range of wavelengths.

5. The light concentrator according to any one of claims 2 to 4,

wherein the other predetermined wavelength or range of wavelengths is chosen to have a higher peak photodetection responsivity compared to the predetermined wavelength or range of wavelengths.

6. The light concentrator according to any one of claims 2 to 5,

wherein the Bragg reflector is configured to reflect the fraction of the wavelength-converted light via wavelength-selective Bragg reflection and total internal reflection.

7. The light concentrator according to any one of claims 2 to 6,

wherein the incident light is omnidirectional light.

8. The light concentrator according to any one of claims 2 to 6,

wherein the incident light is directional light.

9. The light concentrator according to any one of claims 1 to 8,

wherein the plurality of optical scatterers comprises silicone resin powder particles, silicon dioxide or titanium dioxide particles.

10. The light concentrator according to any one of claims 1 to 9,

wherein the plurality of luminophores comprises organic dyes, quantum structures, perovskites or lanthanides.

11. The light concentrator according to any one of claims 1 to 10, further comprising:

a photodetector.

12. The light concentrator according to claim 11,

wherein the photodetector is a p-i-n photodiode, an avalanche photodiode, a silicon photomultiplier or a photomultiplier tube.

13. The light concentrator according to any one of claims 1 to 12,

wherein the matrix material is a polymeric resin material.

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

forming a matrix comprising:

a matrix material;

a plurality of luminophores in the matrix; and

a plurality of optical scatterers in the matrix; and

forming a Bragg reflector layer in contact with an outer surface of the matrix, the Bragg reflector layer defining an opening.

15. The method according to claim 14,

wherein the plurality of luminophores is configured to absorb incident light of a predetermined wavelength or range of wavelengths, and further configured to emit wavelength-converted light of another predetermined wavelength or range of wavelengths upon absorption of the incident light;

wherein the plurality of optical scatterers is configured to scatter the incident light and the wavelength-converted light;

wherein the Bragg reflector layer is configured to allow a fraction of the incident light traveling from outside the light concentrator to pass through to the matrix, and is further configured to reflect a fraction of the wavelength-converted light traveling from the matrix towards outside the light concentrator back to the matrix; and

wherein the opening is configured to allow the wavelength-converted light to pass through.