and visible photoluminescence characteristics; and

a lanthanide ion or an aromatic ring compound;

wherein said aluminum hydroxide is prepared from an aluminum hydroxide precursor.

[0013] According to an example, the aluminum hydroxide precursor is preferably any one of aluminum monoacetate, aluminum triacetate, aluminum diacetate,

CLAIMS

1. A solar wavelength conversion material comprising luminescent aluminum hydroxide having ultraviolet absorption and visible photoluminescence characteristics; and

a lanthanide ion or an aromatic ring compound;

wherein said aluminum hydroxide is prepared from an aluminum hydroxide precursor.

2. The solar wavelength conversion material of claim 1, wherein the aluminum hydroxide precursor is any one of aluminum monoacetate, aluminum triacetate, aluminum diacetate, triethyl aluminum, trimethyl aluminum, aluminum alkoxide, diethyl aluminum chloride, aluminum sulfate, aluminum cyanide, aluminum nitrite, aluminum carbonate, aluminum sulfite, aluminum hydroxide , aluminum oxide, aluminum chlorate, aluminum sulfide, aluminum chromate, aluminum trichloride, aluminum perchlorate, aluminum nitrate, aluminum permanganate, aluminum hydrogen carbonate, aluminum phosphate, aluminum oxalate, aluminum hydrogen phosphate, aluminum thiosulfate , aluminum chlorite, aluminum hydrogen sulfate, aluminum dichromate, aluminum bromide, aluminum hypochlorite, aluminum chloride hexahydrate, aluminum dihydrogen phosphate, aluminum phosphite, aluminum potassium sulfate dodeca hydrate, aluminum bromate, or aluminum nitride.

3. The solar wavelength conversion material of claim 1, wherein the solar wavelength conversion material includes an $Al(OH)_3$, $AlOOH$, $5Al_2O_3 \cdot 2H_2O$, or Al_2O_3 structure.

4. The solar wavelength conversion material of claim 1, wherein the luminescent aluminum hydroxide has a size in a range of 1 nm to 1000 μm.

5. The solar wavelength conversion material of claim 1, wherein the luminescent aluminum hydroxide has a porous structure.

6. The solar wavelength conversion material of claim 1, wherein the lanthanide ion is capable of emitting light in a near-infrared, ultraviolet, or visible light wavelength region.

7. The solar wavelength conversion material of claim 1, wherein a precursor of the near-infrared luminescent lanthanide ion is one or more selected from Yb (ytterbium), Nd (neodymium), Er (erbium), Ho (holmium), and Tm (thulium).

8. The solar wavelength conversion material of claim 1, wherein the lanthanide ion precursor contains an element having a photoluminescence wavelength in the visible light wavelength region.

9. The solar wavelength conversion material of claim 1, wherein the lanthanide ion is included in an amount of 0.001 to 10 parts by weight on the basis of 100 parts by weight of the aluminum hydroxide precursor.

10. The solar wavelength conversion material of claim 1, wherein the aromatic ring compound is located within 10 nm from the aluminum hydroxide precursor or aluminum hydroxide derived therefrom, or is formed by a covalent bond.

11. The solar wavelength conversion material of claim 1, wherein the aromatic ring compound is one or more of furan, benzbenzofuran, isobenzbenzofuran, pyrrole, indole, isoindole, thiophene, benzbenzothiophene, imidazole, benzimidazole, purine, pyrazole, indazole, oxazole, benzoxazole, oxazole isoxazole, benzoxazole isoxazole, thiazole, benzbenzothiazole, benzbenzene, naphthalene, anthracene, pyridine, quinoxaline, acridine, pyrimidine, quinazoline, pyridazine, cinnoline, phthalazine, 1,2,3-triazine, 1,2,4-triazine, and 1,3,5-triazine.

12. The solar wavelength conversion material of claim 1, wherein the particle size of the solar wavelength conversion material is 0.5 nm to 500 μm.

13. The solar wavelength conversion material of claim 1, wherein the maximum absorption wavelength of the solar wavelength conversion material is 200 nm to 500 nm

14. The solar wavelength conversion material of claim 1, wherein the maximum emission wavelength of the solar wavelength conversion material is 450 nm to 1100 nm.

15. A solar cell encapsulant comprising a resin having a solar wavelength conversion material dispersed therein, wherein the solar wavelength conversion material is the solar wavelength conversion material according to any one of claims 1 to 14.

16. The encapsulant of claim 15, wherein the encapsulant is in the form of a film having a thickness of 100 μm or less.

17. The encapsulant of claim 15, wherein the encapsulant is EVA (ethylene vinyl acetate), POE (polyolefin elastomer), cross-linked polyolefin (PO), TPU (thermal polyurethane), PVB (polyvinyl butyral), silicone, silicone/polyurethane hybrid, or ionomer.

18. The encapsulant of claim 15, wherein the solar wavelength conversion material is included in an amount of 0.0001 to 10 parts by weight, on the basis of 100 parts by weight of the resin of the encapsulant.

19. A solar cell comprising a solar wavelength conversion material located between an encapsulant on a front surface thereof where sunlight is incident and an interface of the solar cell, wherein the solar wavelength conversion material is the solar wavelength conversion material of any one of claims 1 to 14.

20. The solar cell of claim 19, wherein the solar wavelength conversion material is coated on the front surface of the solar cell or on the back surface of the encapsulant on the front surface of the solar cell.

21. The solar cell of claim 20, wherein the coating is spray coating or screen coating.

22. The solar cell of claim 19, wherein the encapsulant of the solar cell is EVA (ethylene vinyl acetate), POE (polyolefin elastomer), cross-linked polyolefin (PO), TPU (thermal polyurethane), PVB (polyvinyl butyral), silicone, silicone/polyurethane hybrid, or ionomer.

23. A solar cell wherein the encapsulant according to claim 15 is laminated on the front and rear surfaces of the solar cell, glass is laminated on the front surface of the encapsulant located on the front surface of the solar cell, and a back sheet is laminated on the back surface of the encapsulant located on the back surface of the solar cell.