CLAIMS

1. A titanium black dispersion for a wafer level lens comprising:

titanium black particles;

a dispersant; and

an organic solvent,

wherein dispersed objects including titanium black particles contain Si atoms, and a content ratio of Si atoms to Ti atoms (Si/Ti) in the dispersed objects is 0.05 or higher.

2. A photosensitive resin composition for a wafer level lens comprising:

the titanium black dispersion according to claim 1;

a photopolymerizable compound; and

a photopolymerization initiator.

3. A wafer level lens comprising, at a peripheral portion of a lens present on a substrate, a light-shielding film obtained by curing the photosensitive resin composition according to claim 2.

4. A solid-state image pickup device comprising the wafer level lens according to claim 3.

5. The titanium black dispersion for a wafer level lens according to claim 1, wherein the dispersant comprises a graft copolymer.

6. The titanium black dispersion for a wafer level lens according to claim 1, wherein a Si/Ti ratio of the dispersed objects is from 0.05 to 0.5.

7. The titanium black dispersion for a wafer level lens according to claim 1, wherein a Si/Ti ratio of the dispersed objects is from 0.07 to 0.4.

8. The photosensitive resin composition for a wafer level lens according to claim 2, wherein the photopolymerization initiator comprises an oxime ester compound.

CLAIMS

1. A titanium black dispersion for a wafer level lens comprising:

titanium black particles;

a dispersant , wherein the dispersant comprises a graft copolymer; and

an organic solvent,

wherein 90% or more of dispersed objects that consist of the titanium black particles have particle diameters of 30 nm or less.

2. A photosensitive resin composition for a wafer level lens comprising:

the titanium black dispersion according to claim 1;

a photopolymerizable compound; and

a photopolymerization initiator.

3. A wafer level lens comprising, at a peripheral portion of a lens present on a substrate, a light-shielding film obtained by curing the photosensitive resin composition according to claim 2.

4. A solid-state image pickup device comprising the wafer level lens according to claim 3.

5. A titanium black dispersion for a wafer level lens comprising:

titanium black particles;

a dispersant; and

an organic solvent,

wherein dispersed objects including titanium black particles contain Si atoms, and a content ratio of Si atoms to Ti atoms (Si/Ti) in the dispersed objects is 0.05 or higher.

6. A photosensitive resin composition for a wafer level lens comprising:

the titanium black dispersion according to claim 5;

a photopolymerizable compound; and

a photopolymerization initiator.

7. A wafer level lens comprising, at a peripheral portion of a lens present on a substrate, a light-shielding film obtained by curing the photosensitive resin composition according to claim 6.

8. A solid-state image pickup device comprising the wafer level lens according to claim 7.

9. A titanium black dispersion comprising:

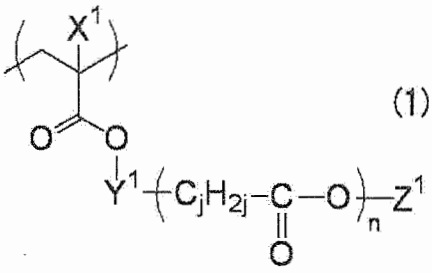
titanium black particles;

a dispersant, wherein the dispersant is a graft copolymer having a graft chain in which a number of atoms excluding hydrogen atoms is from 40 to 10000; and

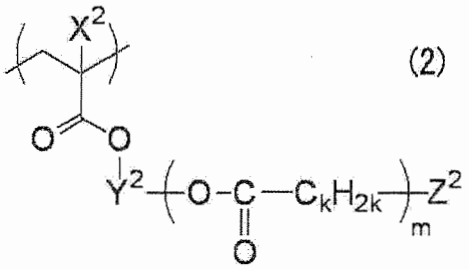
an organic solvent,

wherein 90% or more of dispersed objects that consist of the titanium black particles have particle diameters of 30 nm or less, and the titanium black dispersion is used for formation of a light-shielding film that is provided on one side of a silicon substrate having an image pickup device section on the other side thereof, and that shields against infrared light.

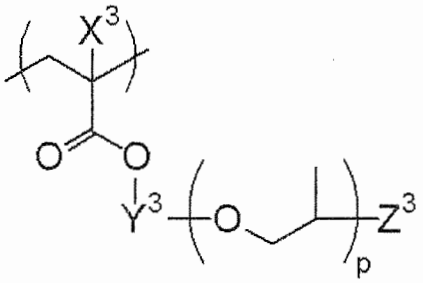
10. The titanium black dispersion according to claim 9, wherein the graft copolymer comprises at least a structural unit represented by any one of the following Formulae (1) to (5):



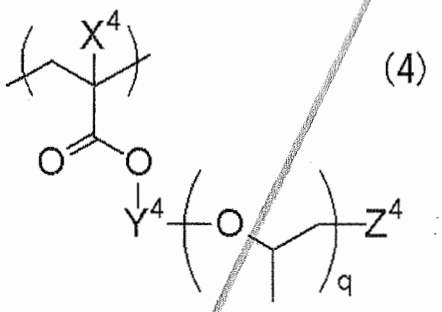
(1)



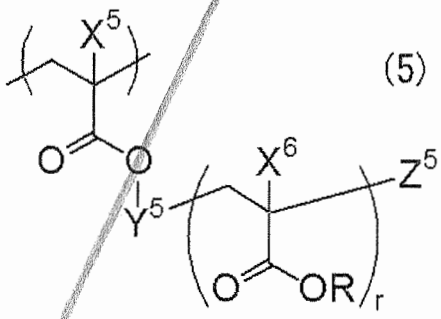
(2)



(3)



(4)



(5)

wherein, in Formulae (1) to (5), X^1, X^2, X^3, X^4, X^5, and X^6 each independently represent a hydrogen atom or a monovalent organic group; Y^1, Y^2, Y^3, Y^4, and Y^5 each independently represent a divalent linking group; Z^1, Z^2, Z^3, Z^4, and Z^5 each independently represent a monovalent organic group; R represents a hydrogen atom or a monovalent organic group; and R's having different structures may be used in mixture in the copolymer; *n*, *m*, *p*, *q*, and *r* each represent an integer of 1 to 500; and *j* and *k* each independently represent an integer of 2 to 8.

11. The titanium black dispersion according to claim 10, wherein the graft copolymer comprises a structural unit represented by any one of Formulae (1) to (5) in a range of from 10% by mass to 90% by mass relative to a total mass of the graft copolymer.

12. A photosensitive resin composition comprising:

the titanium black dispersion according to any one of claims 9 to 11;

a photopolymerizable compound; and

a photopolymerization initiator,

wherein the photosensitive resin composition is used for formation of a light-

shielding film that is provided on one side of a silicon substrate having an image pickup device section on the other side thereof, and that shields against infrared light.

13. A light-shielding film formed on one side of a silicone substrate having an image pickup device section on the other side thereof using the photosensitive resin composition according to claim 12.

14. A method for producing a light-shielding film comprising:

applying the photosensitive resin composition according to claim 12 to one side of a silicon substrate having an image pickup device section on the other side thereof to form a photosensitive layer;

patternwise exposing the photosensitive layer to light; and

developing the photosensitive layer after exposure to form a pattern.

15. A solid-state image pickup device comprising the light-shielding film according to claim 13 on the one side of the silicon substrate having an image pickup device section on the other side thereof.

16. A solid-state image pickup device comprising:

a silicon substrate having an image pickup device section on one side thereof;

a metal electrode provided on the other side of the silicon substrate and electrically connected to the image pickup device section; and

the light-shielding film according to claim 13 provided on the side of the silicon substrate on which the metal electrode is provided, and patterned to expose at least a part of the metal electrode.

17. The photosensitive resin composition for a wafer level lens according to claim 2, wherein the photopolymerization initiator comprises an oxime ester compound.

18. The photosensitive resin composition for a wafer level lens according to claim 2, wherein a content of the titanium black particles in the photosensitive resin composition is from 2.5% by mass to 30% by mass.

19. The photosensitive resin composition for a wafer level lens according to claim 2, wherein a content of the titanium black particles in the photosensitive resin composition is from 5% by mass to 20% by mass.

20. The titanium black dispersion for a wafer level lens according to claim 5, wherein the dispersant comprises a graft copolymer.

21. The titanium black dispersion for a wafer level lens according to claim 5, wherein a Si/Ti ratio of the dispersed objects is from 0.05 to 0.5.

22. The titanium black dispersion for a wafer level lens according to claim 5, wherein a Si/Ti ratio of the dispersed objects is from 0.07 to 0.4.

23. The photosensitive resin composition for a wafer level lens according to claim 6, wherein the photopolymerization initiator comprises an oxime ester compound.

24. The titanium black dispersion according to claim 9, wherein the dispersant comprises a graft copolymer.

25. The photosensitive resin composition according to claim 12, wherein the photopolymerization initiator comprises an oxime ester compound.

26. The photosensitive resin composition according to claim 12, wherein a content of the titanium black particles in the photosensitive resin composition is from 2.5% by mass to 30% by mass.

27. The photosensitive resin composition according to claim 12, wherein a content of the titanium black particles in the photosensitive resin composition is from 5% by mass to 20% by mass.