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;

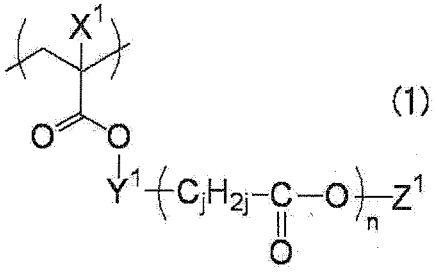
a dispersant, wherein the dispersant is a graft copolymer having a graft chain in which a number of atoms excluding hydrogen atoms is from 40 to 10000; and

an organic solvent,

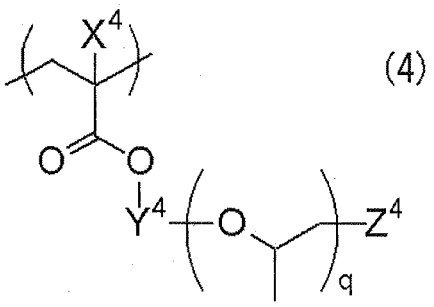
wherein 90% or more of dispersed objects that consist of the titanium black particles have particle diameters of 30 nm or less, and the titanium black dispersion is used for formation of a light-shielding film that is provided on one side of a silicon substrate having an image pickup device section on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

~~10. The titanium black dispersion according to claim 9, wherein the dispersant is a graft copolymer having a graft chain in which a number of atoms excluding hydrogen atoms is from 40 to 10000.~~

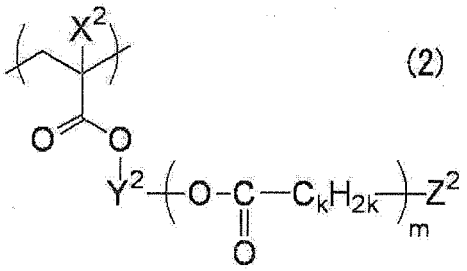
~~11~~10. The titanium black dispersion according to claim ~~10~~9, wherein the graft copolymer comprises at least a structural unit represented by any one of the following Formulae (1) to (5):



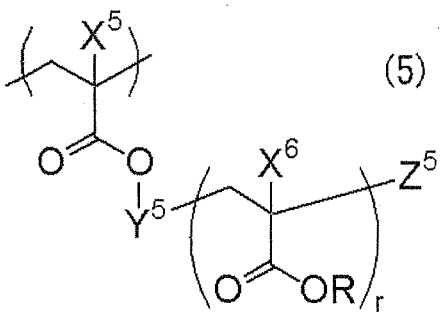
(1)



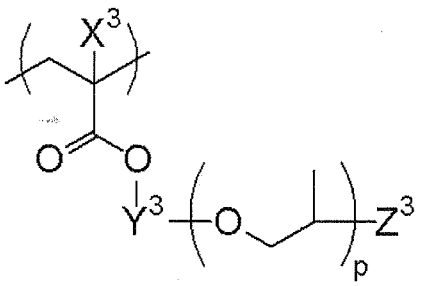
(4)



(2)



(5)



(3)

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.

~~12~~11. The titanium black dispersion according to claim ~~11~~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.

~~13~~12. A photosensitive resin composition comprising:

the titanium black dispersion according to any one of claims 9 to ~~12~~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.

~~14~~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 ~~13~~12.

~~15~~14. A method for producing a light-shielding film comprising:

applying the photosensitive resin composition according to claim ~~13~~ 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.

~~16~~15. A solid-state image pickup device comprising the light-shielding film according to claim ~~14~~ 13 on the one side of the silicon substrate having an image pickup device section on the other side thereof.

~~17~~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 ~~14~~ 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.

~~18. The titanium black dispersion for a wafer level lens according to claim 1, wherein the dispersant comprises a graft copolymer.~~

~~19~~17. The photosensitive resin composition for a wafer level lens according to claim 2, wherein the photopolymerization initiator comprises an oxime ester compound.

~~20~~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.

~~21~~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.

~~22~~20. The titanium black dispersion for a wafer level lens according to claim 5, wherein the dispersant comprises a graft copolymer.

~~23~~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.

~~24~~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.

~~25~~23. The photosensitive resin composition for a wafer level lens according to claim 6, wherein the photopolymerization initiator comprises an oxime ester compound.

~~26~~24. The titanium black dispersion according to claim 9, wherein the dispersant comprises a graft copolymer.

~~27~~25. The photosensitive resin composition according to claim ~~13~~12, wherein the photopolymerization initiator comprises an oxime ester compound.

~~28~~26. The photosensitive resin composition according to claim ~~13~~12, wherein a content of the titanium black particles in the photosensitive resin composition is from 2.5% by mass to 30% by mass.

~~29~~27. The photosensitive resin composition according to claim ~~13~~12, wherein a content of the titanium black particles in the photosensitive resin composition is from 5% by mass to 20% by mass.