CLAIMS

1. A ceria-based composite particle dispersion, containing a ceria-based composite particle that has an average particle size of 50 to 350 nm and is featured by [1] to [3] below:

[1] the ceria-based composite particle has a mother particle, a cerium-containing silica layer on the surface of the mother particle, and a child particle dispersed inside the cerium-containing silica layer;

[2] the mother particle contains amorphous silica as a major ingredient, and the child particle contains crystalline ceria as a major ingredient; and

[3] the ceria-based composite particle has an average crystallite size of the crystalline ceria, when analyzed by X-ray diffractometry, of 10 to 25 nm.

2. The ceria-based composite particle dispersion according to claim 1, containing the ceria-based composite particle further featured by [4] to [7] below:

[4] the ceria-based composite particle further has an easily soluble silica-containing layer as the outermost layer;

[5] ratio D of mass D_1 of the easily soluble silica-containing layer to mass D_2 of the ceria-based composite particle ($D = D_1/D_2 \times 100$) is 0.08 to 30%;

[6] the ceria-based composite particle has a mass ratio of silica and ceria of 100:11 to 316; and

[7] the ceria-based composite particle, when analyzed by X-ray diffractometry, shows only a crystal phase of ceria.

3. The ceria-based composite particle dispersion according to claim 1 or 2,

wherein the child particle demonstrates a particle size distribution with a coefficient of variation (CV value) of 10 to 60%.

4. The ceria-based composite particle dispersion according to claim 1 or 2, further featured by [8] below:

[8] the crystalline ceria contained as a major ingredient of the child particle has silicon atom solid-solubilized therein.

5. The ceria-based composite particle dispersion according to claim 1 or 2,

demonstrating a negative streaming potential before being subjected to cation

colloidal titration, within the pH range from 3 to 8.

6. The ceria-based composite particle dispersion according to claim 1 or 2,

demonstrating, when subjected to the cation colloidal titration, a streaming potential curve indicating a ratio (ΔPCD/V), given by formula (1) below, of -110.0 to -15.0, where ΔPCD denotes amount of change of streaming potential, and V denotes amount of addition of a cation colloidal titrant (V) at a knick:

$\Delta PCD/V = (I - C)/V$ ⋯ Formula (1)

C: streaming potential (mV) at the knick;

I: streaming potential (mV) at the start point of the streaming potential curve; and

V: amount of addition of the cation colloidal titrant (ml) at the knick.

7. The ceria-based composite particle dispersion according to claim 1, containing the ceria-based composite particle further featured by [9] to [11] below:

[9] the crystalline ceria in the child particle has silicon atom solid-solubilized therein, and additionally has one or more different atoms solid-solubilized therein;

[10] each of contents of cerium, silicon and the different atom(s) in the ceria-based composite particle satisfies a relation given by $(Ce + M)/Si = 0.038$ to 1.11, where M means a total mole number of one or more different atoms, and Ce and Si mean mole numbers of cerium atom and silicon atom, respectively; and

[11] the ceria-based composite particle, when analyzed by X-ray diffractometry, shows (i) only a crystal phase of ceria, or (ii) only a crystal phase of ceria and crystal phase(s) of oxide(s) of the different atom(s).

8. The ceria-based composite particle dispersion according to claim 7,

wherein the different atom is a metal atom.

9. The ceria-based composite particle dispersion according to claim 2 or 7,

wherein cerium atom and silicon atom contained in the child particle satisfy a relation given by $R_1 < R_2$, where R_1 represents interatomic distance of adjoining cerium and silicon atoms, and R_2 represents interatomic distance of adjoining cerium atoms.

10. The ceria-based composite particle dispersion according to claim 2 or 7,

wherein the child particle has a geometric mean particle size of 10 to 30 nm.

11. A polishing abrasive particle dispersion containing the ceria-based composite particle dispersion described in claim 2 or 7.

12. The polishing abrasive particle dispersion according to claim 11,

intended to be used for planarizing a semiconductor substrate having a silica film formed thereon.

13. A method for manufacturing a ceria-based composite particle dispersion, the method comprising the Steps 1 to 3 below:

Step 1: keeping a silica-based particle dispersion, having a silica-based particle dispersed in a solvent, stirred at a temperature of 0 to 20°C, at a pH of 7.0 to 9.0, and at a redox potential of 50 to 500 mV, and adding thereto a metal salt of cerium continuously or intermittently, to thereby obtain a precursor particle dispersion that contains a precursor particle;

Step 2: drying the precursor particle dispersion, firing the precursor particle at 800 to 1,200°C, bringing the obtained fired product into contact with a solvent, and wet crushing the fired product within the pH range from 8.6 to 11.5, to obtain a crushed fired product dispersion; and

Step 3: centrifuging the crushed fired product dispersion at a relative centrifugal acceleration of 300 G or larger, and then removing a sediment fraction, to thereby obtain the ceria-based composite particle dispersion.

14. The method for manufacturing a ceria-based composite particle dispersion according to claim 13,

wherein the Step 2 is conducted in such a way that drying the precursor particle dispersion, firing the precursor particle at 800 to 1,200°C, bringing the obtained fired product into contact with a solvent, wet crushing the fired product within the pH range from 8.6 to 11.5, adding a silica-containing additive, and ripening the mixture by heating at 10 to 98°C, to thereby obtain the crushed fired product dispersion.

15. The method for manufacturing a ceria-based composite particle dispersion according to claim 13 or 14,

wherein the Step 3 is conducted in such a way that centrifuging the crushed fired

product dispersion at a relative centrifugal acceleration of 300 G or larger, removing a sediment fraction, adding a silica-containing additive, and ripening the mixture by heating at 10 to 98°C, to thereby obtain the ceria-based composite particle dispersion.

16. A method for manufacturing a ceria-based composite particle dispersion, the method comprising the Steps 4 to 6 below:

Step 4: keeping a silica-based particle dispersion, having a silica-based particle dispersed in a solvent, stirred at a temperature of 0 to 20°C, at a pH of 7.0 to 9.0, and at a redox potential of 50 to 500 mV, and adding thereto a metal salt of cerium and a salt containing different atom independently or in a premixed manner, continuously or intermittently, to thereby obtain a precursor particle dispersion that contains a precursor particle;

Step 5: drying the precursor particle dispersion, firing the precursor particle at 800 to 1,200°C, bringing the obtained fired product into contact with a solvent, wet crushing the fired product within the pH range from 8.6 to 10.8, to obtain a crushed fired product dispersion; and

Step 6: centrifuging the crushed fired product dispersion at a relative centrifugal acceleration of 300 G or larger, and then removing a sediment fraction, to thereby obtain the ceria-based composite particle dispersion.

17. The method for manufacturing a ceria-based composite particle dispersion according to claim 16,

wherein the Step 4 is conducted in such a way that adding the metal salt of cerium, the salt containing different atom, and a silica source independently or in a mixed manner, into the silica-based particle dispersion, to thereby obtain the precursor particle dispersion.

18. The method for manufacturing a ceria-based composite particle dispersion according to claim 16 or 17,

wherein the Step 4 is conducted in such a way that continuously or intermittently adding the metal salt of cerium and the salt containing different atom independently or in a premixed manner, into the silica-based particle dispersion kept stirred, at a temperature of 0 to 20°C, at a pH of 7.0 to 9.0, and at a redox potential of 50 to 500 mV; and then continuously or intermittently adding the metal salt of cerium and the salt containing different atom independently or in a premixed manner, into the silica-based particle dispersion kept

stirred at a temperature above 20°C and not higher than 98°C, at a pH of 7.0 to 9.0, and at a redox potential of 50 to 500 mV, to thereby obtain the precursor particle dispersion.

19. The method for manufacturing a ceria-based composite particle dispersion according to claim 16 or 17,

wherein the Step 4 is conducted in such a way that continuously or intermittently adding the metal salt of cerium and the salt containing different atom independently or in a premixed manner, into the silica-based particle dispersion kept stirred at a temperature above 20°C and not higher than 98°C, at a pH of 7.0 to 9.0, and at a redox potential of 50 to 500 mV; and then continuously or intermittently adding the metal salt of cerium and the salt containing different atom independently or in a premixed manner, into the silica-based particle dispersion kept stirred at a temperature of 0 to 20°C, at a pH of 7.0 to 9.0, and at a redox potential of 50 to 500 mV, to thereby obtain the precursor particle dispersion.