C L A I M S

1. Process for producing cerium oxide particles, comprising the following steps:

(a) contacting, under an inert atmosphere, (i) an aqueous solution of a base, (ii) an aqueous solution comprising NO_3^-, Ce^{III}, optionally Ce^{IV}, and (iii) an organic acid or a salt thereof to obtain a mixture, wherein the organic acid is a substituted or unsubstituted -aryl or -heteroaryl carboxylic acid;

(b) subjecting the mixture obtained in step (a) to a thermal treatment;

(c) optionally acidifying the mixture obtained in step (b);

(d) optionally washing with water the solid material obtained at the end of step (b) or (c);

(e) optionally subjecting the solid material obtained at the end of step (d) to a mechanical treatment to deagglomerate the particles.

2. Process according to claim 1, wherein the organic acid is a substituted or unsubstituted heteroaryl carboxylic acid, preferably an unsubstituted heteroaryl carboxylic acid, more preferably an unsubstituted heteroaryl carboxylic acid which bears at least one nitrogen atom in the heteroaryl group.

3. Process according to claims 1 or 2, wherein the organic acid is picolinic acid.

4. Process according to any one of claims 1 to 3, wherein the thermal treatment of step (b) is carried out at a temperature ranging from 75°C to 95°C.

~~5. Cerium oxide particles obtainable by the process according to any one of claims 1 to 4.~~

~~6. Cerium oxide particles characterized in that said particles exhibit a roughness index RI of at least 5, wherein RI is defined by the formula:~~

$$RI = \frac{TEM\ size}{SSA\ size}$$

~~wherein "TEM size" denotes the average size of the particles measured on transmission electron microscopy images and " SSA size" denotes the theoretical average size of the particles according to the following formula:~~

~~$$SSA\ size = \frac{6}{SSA \times \rho}$$~~

~~wherein SSA denotes the BET specific surface area of the particles determined by nitrogen adsorption and ρ denotes the density of cerium(IV) oxide and is equal to 7.22 g/cm^3.~~

~~7. Cerium oxide particles according to claim 6, characterized in that said particles are substantially cubical.~~

~~8. Cerium oxide particles according to claim 6 or 7, characterized in that the images of the particles obtained by TEM exhibit 4 sides having substantially the same length and are such that the adjacent sides of these 4 sides form an angle which is substantially equal to 90°.~~

~~9. Cerium oxide particles according to any one of claims 6 to 8, characterized in that said particles exhibit a carbon weight ratio ranging from 0.001 wt% to 5 wt%, in particular from 0.1 wt% to 2.5 wt%.~~

~~10. Cerium oxide particles according to any one of claims 6 to 9, characterized in that said particles exhibit a specific surface area comprised between 15 and 100 m2/g, more particularly between 38 and 80 m2/g, more particularly between 40 and 70 m2/g, even more particularly between 42 and 60 m2/g.~~

~~11. Cerium oxide particles according to claims 10, characterized in that said particles exhibit a specific surface area comprised between 22 and 70 m2/g.~~

~~12. Cerium oxide particles according to any one of claims 6 to 11, characterized in that said particles exhibit an average size from 30 to 500 nm, in particular from 70 to 300 nm, said average size being measured from TEM images.~~

~~13. Cerium oxide particles according to claim 12 characterized in that said particles exhibit an average size comprised between 120 and 300 nm, in particular between 125 and 270 nm, more particularly between 130 and 250 nm, even more particularly between 140 and 240 nm, said average size being measured from TEM images.~~

~~14. Cerium oxide particles according to any one of claims 6 to 13, which are obtainable by the process according to any one of claims 1 to 4.~~

~~15.~~5. Cerium oxide particles characterized in that said particles are substantially cubical, exhibit a roughness index RI of at least 2.4, particularly of at least 3.5 wherein RI is defined by the formula:

$$RI = \frac{TEM\ size}{SSA\ size}$$

wherein "TEM size" denotes the average size of the particles measured on transmission electron microscopy images from at least 80 particles and " SSA size" denotes the theoretical average size of the particles according to the following formula:

$$SSA\ size\ = \frac{6}{SSA \times \rho}$$

wherein SSA denotes the BET specific surface area of the particles determined by nitrogen adsorption and ρ denotes the density of cerium(IV) oxide and is equal to 7.22 g/cm3 and in that said particles exhibit a carbon weight ratio ranging from 0.001 wt% to 5 wt%, in particular from 0.1 wt% to 2.5 wt%.

~~16. Cerium oxide particles according to claim 15, characterized in that said particles are substantially cubical.~~

~~17.~~6. Cerium oxide particles according to claim ~~15 or 16~~5, characterized in that the images of the particles obtained by TEM exhibit 4 sides having substantially the same length and are such that the adjacent sides of these 4 sides form an angle which is substantially equal to 90°.

~~18.~~7. Cerium oxide particles according to ~~any one of claims 15 to 17~~claim 5 or 6, characterized in that said particles exhibit a specific surface area comprised between 15 and 100 m^2/g, more particularly between 38 and 80 m^2/g, more particularly between 40 and 70 m^2/g, even more particularly between 42 and 60 m^2/g.

~~19.~~8. Cerium oxide particles according to claims ~~18~~7, characterized in that said particles exhibit a specific surface area comprised between 22 and 70 m^2/g.

~~20.~~9. Cerium oxide particles according to any one of claims ~~15 to 19~~5 to 8, characterized in that said particles exhibit an average size from 30 to 500 nm, in particular from 70 to 300 nm, said average size being measured from TEM images.

~~21.~~10. Cerium oxide particles according to claim ~~20~~ 9 characterized in that said particles exhibit an average size comprised between 120 and 300 nm, in particular between 125 and 270 nm, more particularly between 130 and 250 nm, even more particularly between 140 and 240 nm, said average size being measured from TEM images.

~~22.~~11. Cerium oxide particles according to any one of claims ~~15 to 21~~5 to 10, which are obtainable by the process according to any one of claims 1 to 4.

~~23.~~12. Dispersion of cerium oxide particles according to any one of claims ~~6~~ 5 to ~~22~~11 in a liquid medium.

~~24.~~13. Dispersion according to claim ~~23~~ 12 exhibiting a conductivity lower than 300 µS/cm, more particularly lower than 150 µS/cm, even more particularly lower than 100 µS/cm or 50 µS/cm.

~~25.~~14. Use of the cerium oxide particles of any one of claims 5 to ~~22~~11 or of the dispersion of claim~~s~~ ~~22~~12 or ~~23~~13 for the preparation of a polishing composition, more particularly a CMP composition.

~~26.~~15. Polishing composition comprising the cerium oxide particles of any one of claims 5 to ~~22~~11 or the dispersion of claim~~s~~ ~~23~~12 or ~~24~~13.

~~27. Polishing composition according to claim 26 further comprising one or more of the following ingredients:~~

~~- abrasive particles other than the cerium oxide particles of claims 5 6,7,8,9,10, 11,12, 13, 14, 15, 16, 17, or 18, 19, 20 or 21 or of the dispersion of claims 22 or 23; and/or~~

~~- a pH regulator; and/or~~

~~- a surfactant; and/or~~

~~- a rheological control agent, including viscosity enhancing agents and coagulants; and/or~~

~~- an additive selected from a non-ionic polymer, a cationic polymer, an anionic polymer, a quaternary ammonium, a silane, a sulfonated monomer, a phosphonated monomer, an rylate, a starch, a cyclodextrin1 and combinations thereof.~~

~~28~~16. Method for removing a portion of a substrate, comprising polishing the substrate with a polishing composition according to claim ~~26 or 27~~15.