Claims

1. A Chemical Mechanical Polishing(CMP) composition comprising:

abrasive particles selected from the group consisting of

ceria-coated inorganic oxide particles selected from the group consisting of ceria-coated colloidal silica, ceria-coated high purity colloidal silica, ceria-coated alumina, ceria-coated titania, ceria-coated zirconia particles and combinations thereof;

ceria-coated organic polymer particles selected from the group consisting of ceria-coated polystyrene particles, ceria-coated polyurethane particle, ceria-coated polyacrylate particles, and combinations thereof; and

combinations thereof;

chemical additive;

solvent selected from the group consisting of deionized (DI) water, distilled water, and alcoholic organic solvents; and

optionally

biocide; and

pH adjuster;

wherein

the composition has a pH of 3 to 10;

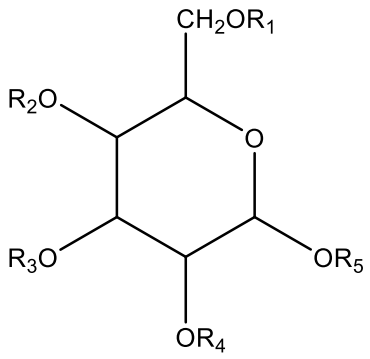
the ceria-coated inorganic oxide particles have a mean particle size of 120 to 500 nm and have a concentration from 0,05 wt.% to 10 wt.%;

the abrasive particles have changes of mean particle size MPS(nm) and D99(nm) ≤ 3.0% over shelf time of ≥ 30 days at a temperature ranging from 20 to 60ºC; wherein D99(nm) is a particle size that 99 wt.% of the particles fall on and under;

and

the chemical additive ranges from 0.05 wt.% to 5 wt.%; and has

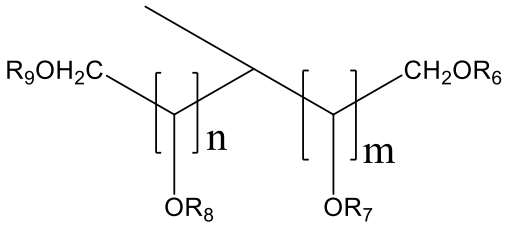
a molecular structure (a):



(a)

wherein the structure (a) has at least six hydroxyl functional groups in its molecular structure; and R1, R2, R3, R4 and R5 (Rs in group of R1 to R5) are selected as following

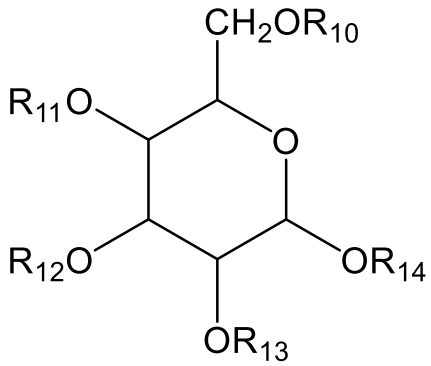
(i)at least one R in the group of R1 to R5 is a polyol molecular unit having a structure shown in (b):



(b);

wherein m or n is independently selected from 1 to 5; and each of R6, R7, R8 and R9 is independently selected from the group consisting of hydrogen, alkyl, alkoxy, organic group with one or more hydroxyl groups, substituted organic sulfonic acid or salt, substituted organic carboxylic acid or salt, organic carboxylic ester, organic amine, and combinations thereof;

(ii)at least one R in the group of R1 to R5 is a six-member ring polyol as shown in (c):



(c);

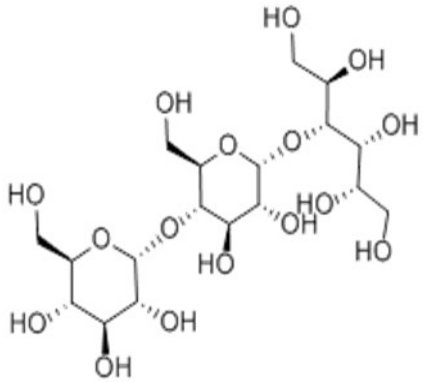
wherein

one of OR in group of OR11, OR12, OR13 and OR14 will be replaced by the at least O in structure (c); and R10 and each of other R in group of R11, R12, R13 and R14 is independently selected from the group consisting of hydrogen, alkyl, alkoxy, organic group with one or more hydroxyl groups, substituted organic sulfonic acid or salt, substituted organic carboxylic acid or salt, organic carboxylic ester, organic amine, and combinations thereof;

and

(iii)each of other Rs in the group of R1 to R5 is independently selected from the group consisting of hydrogen, alkyl, alkoxy, organic group with one or more hydroxyl groups, substituted organic sulfonic acid or salt, substituted organic carboxylic acid or salt, organic carboxylic ester, organic amine, and combinations thereof;

2. The Chemical Mechanical Polishing(CMP) composition of Claim 1, wherein the polyol molecular unit (b) which has n = 2 and m =1; and rest of Rs in the group of R1 to R14 are all hydrogen atoms, as shown below:



Maltotritol;

and the solvent is deionized (DI) water, and
the ceria-coated colloidal silica particles have changes of mean particle size MPS(nm) and D99(nm) ≤ 2.0%.

3. The Chemical Mechanical Polishing(CMP) composition of Claim 1, wherein the abrasive particles are ceria-coated colloidal silica particles.

4. The chemical mechanical polishing composition of Claim 1, wherein the composition comprises ceria-coated colloidal silica particles;
the chemical additive is maltotritol; and
the ceria-coated colloidal silica particles have changes of mean particle size MPS(nm) and D99(nm) ≤ 2.0% over shelf time of ≥ 30 days at a temperature ranging from 20 to 60 ^{0}C; wherein D99(nm) is a particle size that 99 wt.% of the particles fall on and under.

5. The chemical mechanical polishing composition of Claim 1, wherein the composition comprises one selected from the group consisting of from 0.0001 wt.% to 0.05 wt.% of the biocide having active ingredient selected from the group consisting of 5-chloro-2-methyl-4-isothiazolin-3-one, 2-methyl- -isothiazolin-3-one,and combinations thereof; from 0 wt.% to 1 wt.% of the pH adjusting agent selected from the group consisting of nitric acid, hydrochloric acid, sulfuric acid, phosphoric acid, other inorganic or organic acids, and mixtures thereof for acidic pH conditions; or selected

from the group consisting of sodium hydride, potassium hydroxide, ammonium hydroxide, tetraalkyl ammonium hydroxide, organic quaternary ammonium hydroxide compounds, organic amines, and combinations thereof for alkaline pH conditions; and combinations thereof.