R^5 is H, X1, X2, X3, X4, X5, X6, alkyl, aryl, or alkylaryl,

the total number of monosaccharide units (X1, X2, X3, X4, X5, or X6) in the glycoside is in the range of from 1 to 20,

and X1 to X6 are the structural units as indicated in the rectangles in the corresponding formulae 1 to 6,

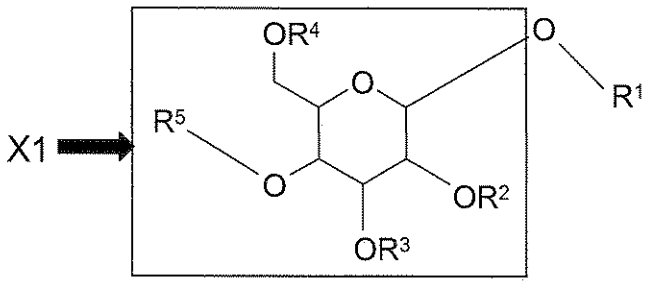
and

(C) an aqueous medium.

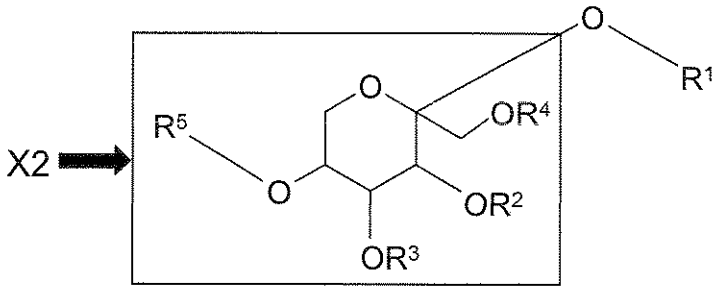
In an aspect, there is provided a chemical mechanical polishing (CMP) composition comprising

(A) colloidal ceria ,

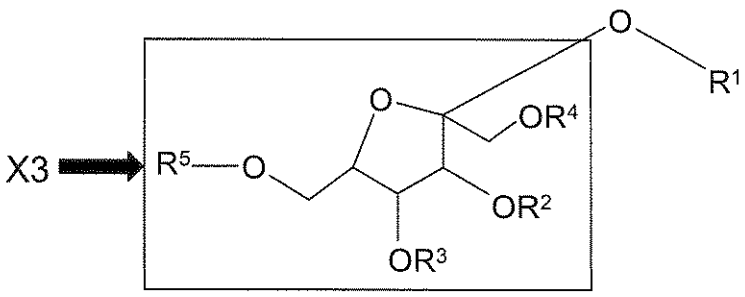
(B) a glycoside of the formulae 1 to 6



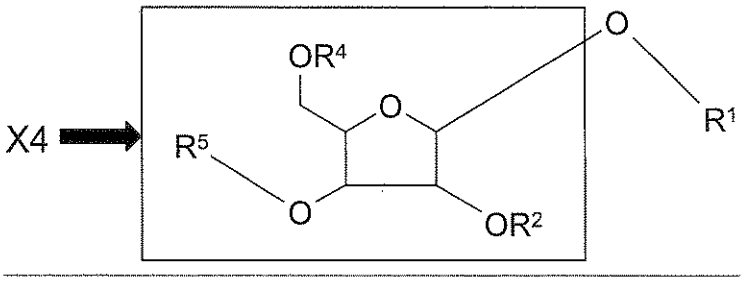
(formula 1)



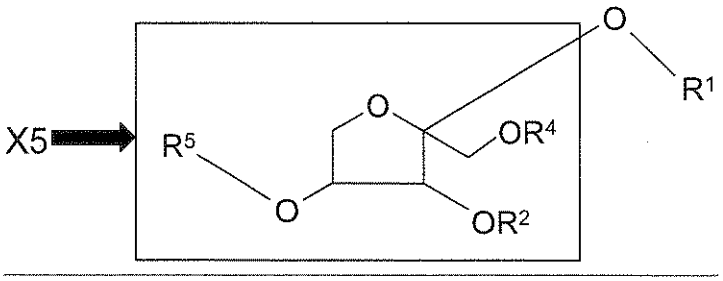
(formula 2)



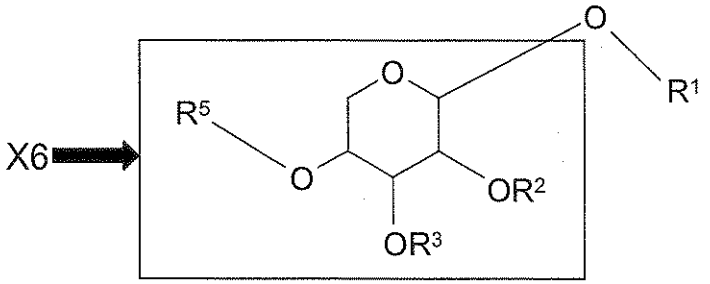
(formula 3)



(formula 4)



(formula 5)



(formula 6)

wherein R^1 is alkyl, aryl, or alkylaryl,
R^2 is H, X1, X2, X3, X4, X5, X6, alkyl, aryl, or alkylaryl,
R^3 is H, X1, X2, X3, X4, X5, X6, alkyl, aryl, or alkylaryl,
R^4 is H, X1, X2, X3, X4, X5, X6, alkyl, aryl, or alkylaryl,
R^5 is H, X1, X2, X3, X4, X5, X6, alkyl, aryl, or alkylaryl,
the total number of monosaccharide units (X1, X2, X3, X4, X5, or X6) in the glycoside is in the range of from 1 to 20,
and X1 to X6 are the structural units as indicated in the rectangles in the corresponding formulae 1 to 6,

and

(C) water.

In addition, the above-mentioned objects of the ~~invention~~ embodiments disclosed herein are achieved by a process for the manufacture of a semiconductor device comprising the polishing of a substrate in the presence of said CMP composition.

In another aspect, there is provided a process for the manufacture of semiconductor devices comprising the chemical mechanical polishing of a substrate comprising silicon dioxide in the presence of a CMP composition as defined above.

Moreover, the use of the CMP composition of the ~~invention~~ disclosure for polishing substrates which are used in the semiconductor industry has been found, which fulfills the objects of the embodiments disclosed herein~~invention~~.

In another aspect, there is provided a use of a CMP composition as defined above for chemical mechanical polishing of a substrate comprising silicon dioxide and silicon nitride or polysilicon.

Preferred embodiments are explained in the claims and the specification. It is understood that combinations of preferred embodiments are within the scope of the present invention.

A semiconductor device can be manufactured by a process which comprises the CMP of a substrate in the presence of the CMP composition of the invention. Preferably, said process comprises the CMP of a dielectric substrate, that is a substrate having a dielectric constant of less than 6. Said process comprises more preferably the CMP of a substrate comprising silicon dioxide, most preferably the CMP of a substrate comprising silicon dioxide and silicon nitride or polysilicon, particularly the CMP of a silicon dioxide layer of a substrate which is a shallow trench isolation (STI) device or a part thereof, for example the CMP of a silicon dioxide layer of a substrate comprising silicon dioxide and silicon nitride or polysilicon.

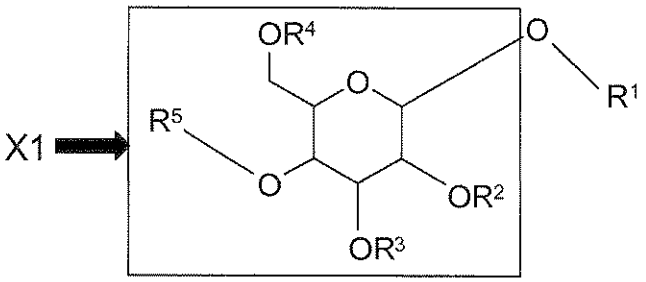
If said process comprises the CMP of a substrate comprising silicon dioxide and silicon nitride, the selectivity of silicon dioxide to silicon nitride with regard to the material removal rate is preferably higher than 15:1, more preferably higher than 25:1, most preferably higher than 35:1, for example higher than 50:1. This selectivity can be adjusted by the type and concentration of glycoside (B) and by setting other parameters such as pH value.

If said process comprises the CMP of a substrate comprising silicon dioxide and polysilicon, the selectivity of silicon dioxide to polysilicon with regard to the material removal rate is preferably higher than 15:1, more preferably higher than 25:1, most preferably higher than 35:1, for example higher than 50:1. This selectivity can be adjusted by the type and concentration of glycoside (B) and by setting other parameters such as pH value.

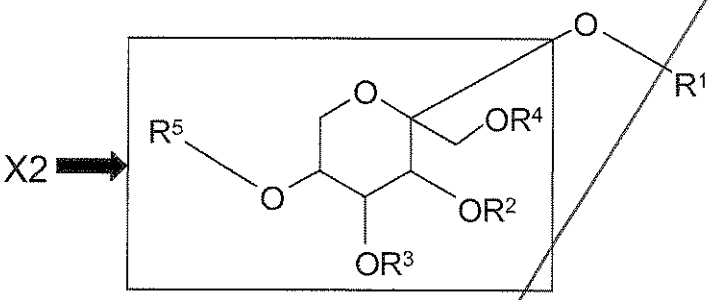
The CMP composition of the invention is used for polishing any substrate used in the semiconductor industry. Said CMP composition is used preferably for polishing a dielectric substrate,

Claims:

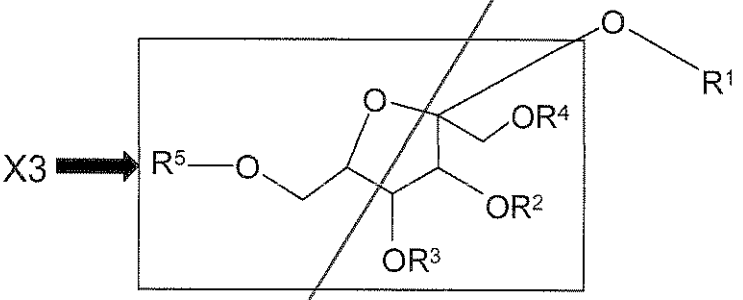
1. A chemical mechanical polishing (CMP) composition comprising
   (A) particles selected from the group consisting of ceria and composite particles comprising ceria,
   (B) a glycoside of the formulae 1 to 6



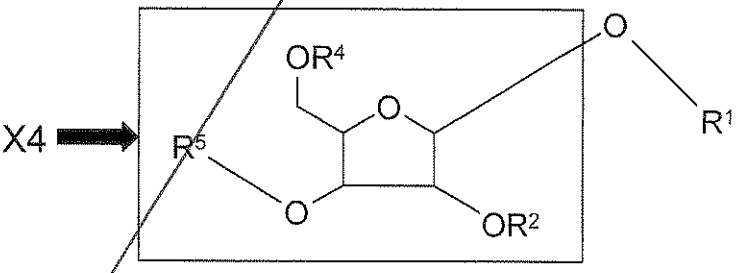
(formula 1)



(formula 2)

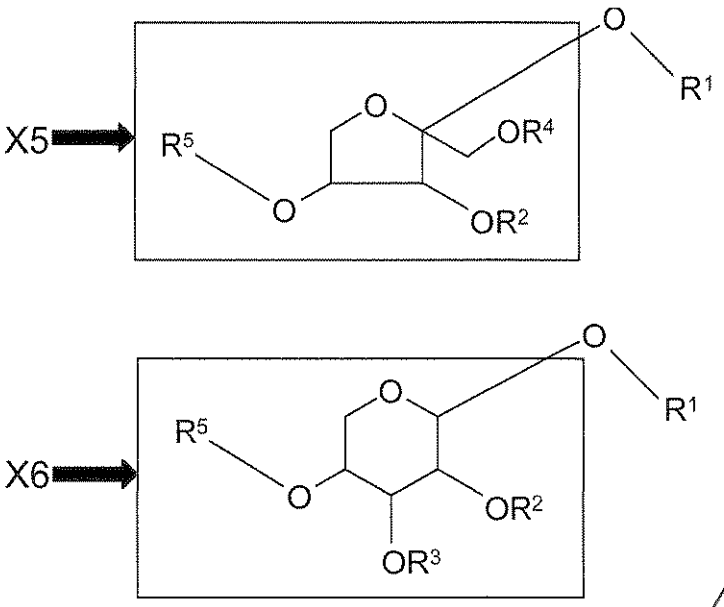


(formula 3)



(formula 4)

(formula 5)



(formula 6)

wherein R^1 is alkyl, aryl, or alkylaryl,
R^2 is H, X1, X2, X3, X4, X5, X6, alkyl, aryl, or alkylaryl,
R^3 is H, X1, X2, X3, X4, X5, X6, alkyl, aryl, or alkylaryl,
R^4 is H, X1, X2, X3, X4, X5, X6, alkyl, aryl, or alkylaryl,
R^5 is H, X1, X2, X3, X4, X5, X6, alkyl, aryl, or alkylaryl,
the total number of monosaccharide units (X1, X2, X3, X4, X5, or X6) in the glycoside is in the range of from 1 to 20,
and X1 to X6 are the structural units as indicated in the rectangles in the corresponding formulae 1 to 6,

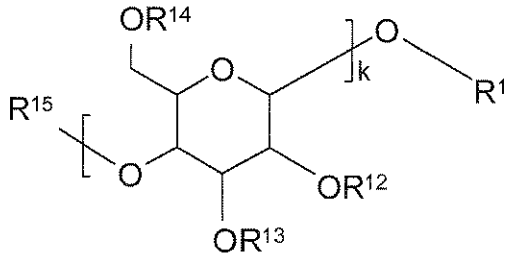
and

(C) an aqueous medium.

2. The CMP composition according to claim 1, wherein the total number of monosaccharide units (X1, X2, X3, X4, X5, or X6) in the glycoside (B) is in the range of from 1 to 5.

3. The CMP composition according to claim 1 or 2, wherein the glycoside is a glycoside of formula 1 and wherein R^1 is alkyl, aryl, or alkylaryl, R^2 is H or X1, R^3 is H or X1, R^4 is H or X1, R^5 is H or X1.

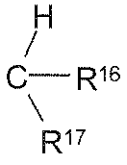
4. The CMP composition according to claim 1, wherein the glycoside is a glycoside of formula 1a



(formula 1a)

wherein R^1 is alkyl, aryl or alkylaryl,
R^{12} is H, alkyl, aryl or alkylaryl,
R^{13} is H, alkyl, aryl or alkylaryl,
R^{14} is H, alkyl, aryl or alkylaryl,
R^{15} is H, alkyl, aryl or alkylaryl,
k is an integer from 1 to 20,

5. The CMP composition according to claim 4, wherein



R^1 is
R^{16} is H, alkyl, aryl or alkylaryl,
R^{17} is H, alkyl, aryl or alkylaryl.

6. The CMP composition according to claim 4 wherein R^1 is CH_2R^{18}, and R^{18} is H, alkyl, aryl or alkylaryl.

7. The CMP composition according to anyone of the claims 4 to 6, wherein R^{12}, R^{13}, R^{14} and R^{15} is H.

8. The CMP composition according to anyone of the claims 4 to 7, wherein k is an integer from 1 to 5.

9. The CMP composition according to anyone of the claims 1 to 8, wherein the particles (A) is ceria.

10. The CMP composition according to anyone of the claims 1 to 9, wherein the concentration of the glycoside (B) is in the range of from 0.01 % to 2 % by weight of the CMP composition.

11. The CMP composition according to anyone of the claims 1 to 10, wherein the glycoside (B) is a glucoside.

12. The CMP composition according to anyone of the claims 1 to 11, wherein the pH value of the CMP composition is in the range of from 5 to 8.5.

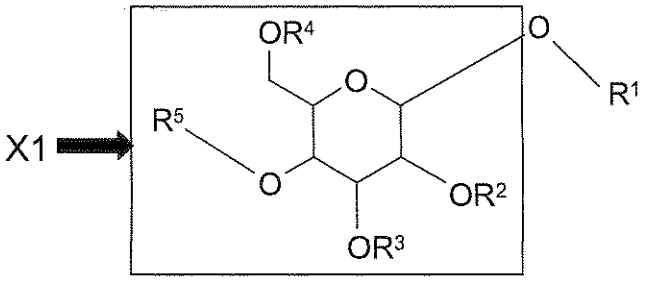
13. The CMP composition according to claim 4, wherein
(A) is ceria,
(B) is a glycoside of the formula 1a
wherein R^1 is CH_2R^8, and R^8 is C_3-C_{29} alkyl, or phenyl,
R^2, R^3, R^4 and R^5 is H,
k is an integer from 1 to 5,
(C) is water.

14. A process for the manufacture of semiconductor devices comprising the chemical mechanical polishing of a substrate comprising silicon dioxide in the presence of a CMP composition as defined in anyone of the claims 1 to 13.

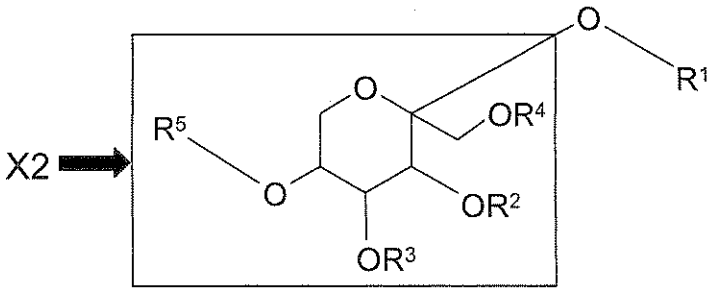
15. Use of a CMP composition as defined in anyone of the claims 1 to 13 for chemical mechanical polishing of a substrate comprising silicon dioxide and silicon nitride or polysilicon.

Claims:

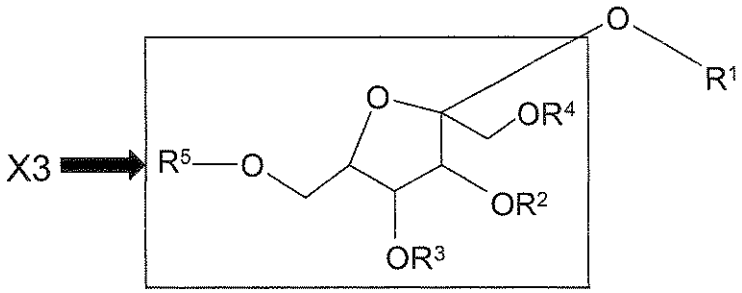
1. A chemical mechanical polishing (CMP) composition comprising
   (A) colloidal ceria ,
   (B) a glycoside of the formulae 1 to 6



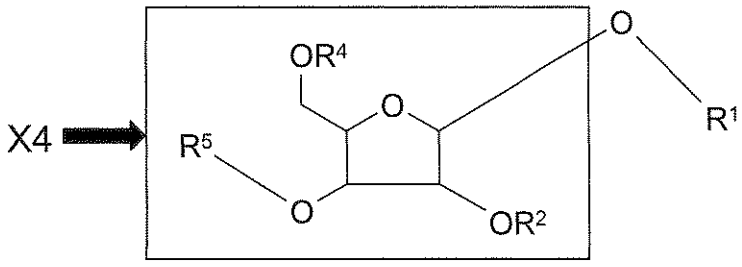
(formula 1)



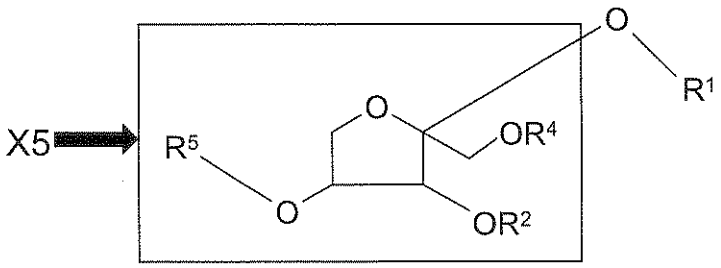
(formula 2)



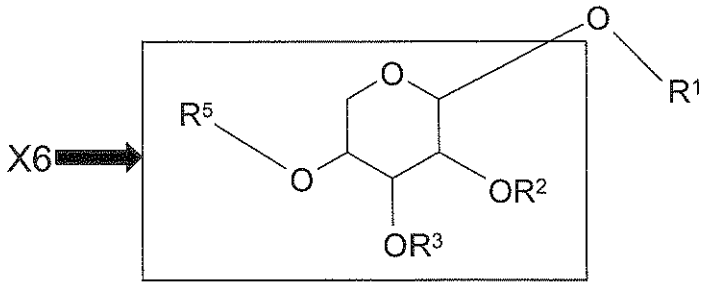
(formula 3)



(formula 4)



(formula 5)



(formula 6)

wherein R^1 is alkyl, aryl, or alkylaryl,
R^2 is H, X1, X2, X3, X4, X5, X6, alkyl, aryl, or alkylaryl,
R^3 is H, X1, X2, X3, X4, X5, X6, alkyl, aryl, or alkylaryl,
R^4 is H, X1, X2, X3, X4, X5, X6, alkyl, aryl, or alkylaryl,
R^5 is H, X1, X2, X3, X4, X5, X6, alkyl, aryl, or alkylaryl,
the total number of monosaccharide units (X1, X2, X3, X4, X5, or X6) in the glycoside is in the range of from 1 to 20,
and X1 to X6 are the structural units as indicated in the rectangles in the corresponding formulae 1 to 6,

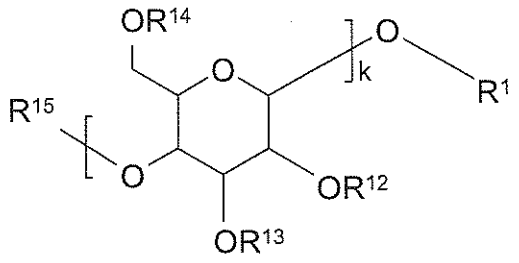
and

(C) water.

2. The CMP composition according to claim 1, wherein the total number of monosaccharide units (X1, X2, X3, X4, X5, or X6) in the glycoside (B) is in the range of from 1 to 5.

3. The CMP composition according to claim 1 or 2, wherein the glycoside is a glycoside of formula 1 and wherein R^1 is alkyl, aryl, or alkylaryl, R^2 is H or X1, R^3 is H or X1, R^4 is H or X1, R^5 is H or X1.

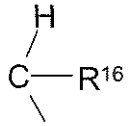
4. The CMP composition according to claim 1, wherein the glycoside is a glycoside of formula 1a



(formula 1a)

wherein R^1 is alkyl, aryl or alkylaryl,
R^{12} is H, alkyl, aryl or alkylaryl,
R^{13} is H, alkyl, aryl or alkylaryl,
R^{14} is H, alkyl, aryl or alkylaryl,
R^{15} is H, alkyl, aryl or alkylaryl,
k is an integer from 1 to 20,

5. The CMP composition according to claim 4, wherein



R^1 is
R^{16} is H, alkyl, aryl or alkylaryl,
R^{17} is H, alkyl, aryl or alkylaryl.

6. The CMP composition according to claim 4 wherein R^1 is CH_2R^{18}, and R^{18} is H, alkyl, aryl or alkylaryl.

7. The CMP composition according to anyone of the claims 4 to 6, wherein R^{12}, R^{13}, R^{14} and R^{15} is H.

8. The CMP composition according to anyone of the claims 4 to 7, wherein k is an integer from 1 to 5.

9. The CMP composition according to anyone of the claims 1 to 8, wherein the concentration of the glycoside (B) is in the range of from 0.01 % to 2 % by weight of the CMP composition.

10. The CMP composition according to anyone of the claims 1 to 9, wherein the glycoside (B) is a glucoside.

11. The CMP composition according to anyone of the claims1 to 10, wherein the pH value of the CMP composition is in the range of from 5 to 8.5.

12. The CMP composition according to claim 4, wherein
    (A) is ceria,
    (B) is a glycoside of the formula 1a
        wherein R^1 is CH_2R^8, and R^8 is C_3-C_{29} alkyl, or phenyl,
        R^2, R^3, R^4 and R^5 is H,
        k is an integer from 1 to 5,
    (C) is water.

13. A process for the manufacture of semiconductor devices comprising the chemical mechanical polishing of a substrate comprising silicon dioxide in the presence of a CMP composition as defined in anyone of the claims 1 to 12.

14. Use of a CMP composition as defined in anyone of the claims 1 to 12 for chemical mechanical polishing of a substrate comprising silicon dioxide and silicon nitride or polysilicon.