Claims

1. A computer or personal communication device, comprising:

central processing unit (CPU);

wherein the display comprises;

an array of optical elements;

a touch sensor; and

a glass cover having a coating that is oleophobic;

wherein the coating is a polymer having silicon, oxygen and carbon in the backbone, and further optionally comprising fluorine, and wherein the coating has a water contact angle of 65 or more, an oil contact angle of 20 degrees or more, and a pencil hardness of 7H or more.

2. A glass substrate having an antireflective and oleophobic coating thereon, wherein the coating is a polymer having silicon, oxygen and carbon in the backbone, and wherein the coating has a refractive index of 1.22 to 1.7, a pencil hardness of 7H or more, a water contact angle of 90 degrees or more and an oil contact angle of 20 degrees or more.

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3. A display with a touch sensitive screen, comprising,

an array of optical elements;

a touch sensor layer;

a cover glass with first optical layer formed thereon;

wherein the first optical layer comprises a polymer having silicon, oxygen and carbon in the backbone, and wherein the optical layer has a refractive index of from 1.22 to 1.46, a pencil hardness of 6H or more, a water contact angle of 65 degrees or more, and an oil contact angle of 20 degrees or more.

4. A method for making a coated glass, comprising:

providing glass to be coated;

coating the glass with a liquid phase coating;

baking and/or UV hardening the coating on the glass;

wherein the coated glass comprises a polymer having silicon, oxygen and carbon in the backbone, and wherein the coating on the glass has a refractive index of 1.22 to 1.7, a pencil hardness of 7H or more, a water contact angle of 65 degrees or more, and an oil contact angle of 20 degrees or more.

5. A method for making a coated glass, comprising:

providing glass to be coated;

coating the glass with a liquid phase coating;

baking and/or UV hardening the coating on the glass;

wherein the coating to be deposited by liquid phase coating is formed by combining:

a first monomer having the chemical formula $R^{11}{}_xR^{12}{}_ySiC_3H_6R^{13}$, wherein R^{11} is an alkoxy, acetoxy or chloro group and where x is 2 or 3, and wherein R^{12} is an alkyl group where y is 0 or 1, and wherein R^{13} is an epoxy, acrylate, methacrylate, phenyl or isocyanate group;

a second monomer having the chemical formula $R^{414a}R^{515b}SiC_2H_4(CF)_n$, wherein R^{14} is an alkoxy, acetoxy or chloro group and where a is 2 or 3, and wherein R^{15} is an alkyl group where b is 0 or 1, and wherein n is an integer from 3 to 25; and

a third monomer having the chemical formula $R^{16c}R^{17d}SiC_2H_4SiR^{18e}R^{919f}$,

wherein R^{16} is a an alkoxy, acetoxy or chloro group and wherein c = 2 or 3, wherein R^{17} is an alkyl group or H and wherein d = 0 or 1, wherein R^{18} is an alkoxy, acetoxy or chloro group and wherein e = 2 or 3, and wherein R^{19} is an alkyl group or H and wherein f = 0 or 1.

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6. A method of increasing the hardness and oleophobicity of a computer or personal communication device having a touch sensitive screen, comprising:

polymerizing a plurality of monomers that comprise silicon, oxygen and carbon so as to form a carbosiloxane polymer with a molecular weight of at least 2000;

depositing the carbosiloxane polymer with a liquid phase process at atmospheric pressure on a glass substrate;

wherein after hardening the polymer on the glass substrate, the carbosiloxane polymer has a hardness of at least 7H, a refractive index of from 1.22 to 1.46, a water contact angle of at least 65 degrees, and an oil contact angle of at least 20 degrees;

further providing a CPU, a display, a touch sensor layer, and a housing so as to form a the computer or personal communication device with a touch sensitive screen;

wherein the amount of sunlight reflected from the glass substrate is at least 1.5% less due to the carbosiloxane polymer layer as compared to the same glass substrate without the carbosiloxane polymer layer.

7. A computer or personal communication device, comprising:

a housing;

a central processing unit (CPU);

and a display;

wherein the display comprises;

an array of optical elements;

a touch sensor; and

a glass cover having a coating that is antireflective and oleophobic;

wherein the coating is a polymer comprising silicon, carbon, oxygen and optionally fluorine, and wherein the atom% of silicon is from 10 to 30, the atomic% of carbon is from 10 to 60, the atomic% of oxygen is from 10 to 60, and the atomic% of fluorine is from 0.1 to 10.

8. A product having at least a portion comprising glass, the glass having an antireflective and oleophobic coating thereon, wherein the coating is a polymer having silicon, oxygen, carbon and fluorine, and wherein the atom% of silicon is from 10 to 30, the atom% of carbon is from 10 to 60, the atom% of oxygen is from 10 to 60, and the atom% of fluorine is from 1 to 40.

9. A display comprising:

an array of optical elements;

a touch sensor; and

a glass cover having a coating, wherein the coating is a polymer comprising silicon, carbon, oxygen and fluorine, and wherein the atom% of silicon is from 10 to 30, the atomic% of carbon is from 10 to 60, the atomic% of oxygen is from 10 to 60, and the atomic% of fluorine is from 0.1 to 10.

10. A composition of a hybrid organic-inorganic material having an inorganic portion comprising silicon, oxygen and carbon, and further comprising an organic portion with

organic groups connected to the inorganic portion, said material comprising polymers obtained from polymerization of monomers according to

formula I

$$R^1{}_aSiX_{4-a} \qquad I$$

or formula II

$$R^2{}_bSiX_{4-b} \qquad II$$

wherein R^1 and R^2 are independently selected from the group consisting of hydrogen, linear and branched alkyl and cycloalkyl, alkenyl, alkynyl, (alk)acrylate, epoxy, allyl, vinyl and alkoxy and aryl having 1 to 6 rings; each X represents independently a hydrolysable group or a hydrocarbon residue; and
a and b is an integer 1 to 3;

or formula III

$$R^3{}_cSiX_{4-c} \qquad III$$

wherein R^3 stands for hydrogen, alkyl or cycloalkyl which optionally carries one or several substituents, such as halo (e.g. fluoro), or alkoxy;
each X represents independently a hydrolysable group or a hydrocarbon residue having the same meaning as above; and
c is an integer 1 to 3,

or combinations thereof,

together with monomers of formula VI:

$$(R^6)_3Si\text{-}Y\text{-}Si(R^7)_3, \qquad VI$$

wherein R^6 and R^7 are independently selected from hydrogen and a group consisting of linear or branched alkyl, cycloalkyl, alkenyl, alkynyl,

(alk)acrylate, epoxy, allyl, vinyl, alkoxy and aryl having 1 to 6 rings, and wherein the group is substituted or unsubstitued; and

Y is a linking group selected from unsubstituted and substituted bivalent aliphatic and aromatic groups, such as alkylene, arylene, -O-alkylene-O-; -O-arylene-O-; alkylene-O-alkylene, arylene-O-arylene; alkylene-$Z^1C(=O)Z^2$-alkylene, arylene-$Z^1C(=O)Z^2$-arylene and -O-alkylene-$Z^1(=O)Z^2$-alkylene-O-; –O-arylene-$Z^1(=O)Z^2$-arylene-O-, wherein Z^1 and Z^2 are each selected from a direct bond or -O-.

11. Use of a composition of claim 10 in a device according to claim 1, on a glass substrate according to claim 2, a display according to claim 3, a method according to any of claims 4 to 6, a device according to claim 7, or a product according to any of claims 8 or 9.

12. Use of a composition of a hybrid organic-inorganic material having an inorganic portion comprising silicon, oxygen and carbon, and further comprising an organic portion with organic groups connected to the inorganic portion, said material comprising polymers obtained from polymerization of monomers according to formula VI:

$$(R^6)_3Si\text{-}Y\text{-}Si(R^7)_3, \qquad VI$$

wherein R^6 and R^7 are independently selected from hydrogen and a group consisting of linear or branched alkyl, cycloalkyl, alkenyl, alkynyl, (alk)acrylate, epoxy, allyl, vinyl, alkoxy and aryl having 1 to 6 rings, and wherein the group is substituted or unsubstitued; and

Y is a linking group selected from unsubstituted and substituted bivalent aliphatic and aromatic groups, such as alkylene, arylene, -O-alkylene-O-; -O-arylene-O-; alkylene-O-alkylene, arylene-O-arylene; alkylene-$Z^1C(=O)Z^2$-alkylene, arylene-$Z^1C(=O)Z^2$-arylene and -O-alkylene-$Z^1(=O)Z^2$-alkylene-O-; –O-arylene-$Z^1(=O)Z^2$-arylene-O-, wherein Z^1 and Z^2 are each selected from a direct bond or -O-,

in a device according to any of claims 1 to 9, on a glass substrate according to any of claims 10 to 21, a display according to any of claims 22 to 34, a method according to any of claims 35 to 61, a device according to any of claims 62 to 69, or a product according to any of claims 70 to 79.

13. Method of producing a composition according to claim 11, wherein

- at least one or several monomers of formulas I to III is homopolymerized or are copolymerized, preferably by first hydrolysing the monomers and then condensation polymerizing them, to form a first homo- or copolymer containing residues of monomers having a formula I to III; and
- at least one monomer of formula VI is is homopolymerized or are copolymerized, preferably by first hydrolysing the monomers and then condensation polymerizing them, to form a homo- or copolymer containing residues of monomers having formula VI; and
- mixing the such obtained first and second polymers to form a polymer blend.

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