CLAIMS

1. A surface treatment composition, comprising:

at least one siloxane compound in an amount of from about 20 wt% to about 99.9 wt% of the surface treatment composition, wherein the at least one siloxane compound comprises a disiloxane, an oligosiloxane, a cyclosilxoane, or a polysiloxane, provided that the at least one siloxane compound is not a polydimethylsiloxane; and

at least one additive comprising an acid having a pKa of at most 0 or an anhydride thereof in an amount of from about 0.1 wt% to about 10 wt% of the surface treatment composition.

2. The composition of claim 1, wherein the at least one siloxane compound comprises hexamethyldisiloxane, 1,3-diphenyl-1,3-dimethyldisiloxane, 1,1,3,3-tetramethyldisiloxane, 1,1,1-triethyl-3,3-dimethyldisiloxane, 1,1,3,3-tetra-n-octyldimethyldisiloxane, bis(nonafluorohexyl)tetramethyldisiloxane, 1,3-bis(trifluoropropyl)tetramethyldisiloxane, 1,3-di-n-butyltetramethyldisiloxane, 1,3-di-n-octyltetramethyldisiloxane, 1,3-diethyltetramethyldisiloxane, 1,3-diphenyltetramethyldisiloxane, hexa-n-butyldisiloxane, hexaethyldisiloxane, hexavinyldisiloxane, 1,1,1,3,3-pentamethyl-3-acetoxydisiloxane, 1-allyl-1,1,3,3-tetramethyldisiloxane, 1,3-bis(3-aminopropyl)tetramethyldisiloxane, 1,3-bis(heptadecafluoro-1,1,2,2-tetrahydrodecyl)tetramethyldisiloxane, 1,3-divinyltetraphenyldisiloxane, 1,3-divinyltetramethyldisiloxane, 1,3-diallyltetrakis(trimethylsiloxy)disiloxane, 1,3-diallyltetramethyldisiloxane, 1,3-diphenyltetrakis(dimethylsiloxy)disiloxane, (3-chloropropyl)pentamethyldisiloxane, 1,3-divinyltetrakis(trimethylsiloxy)disiloxane, 1,1,3,3-tetraisopropyldisiloxane, 1,1,3,3-tetravinyldimethyldisiloxane, 1,1,3,3-tetracyclopentyldichlorodisiloxane, vinylpentamethyldisiloxane, 1,3-bis(3-chloroisobutyl)tetramethyldisiloxane, hexaphenyldisiloxane, 1,3-bis[(bicyclo[2.2.1]hept-2-enyl)ethyl]tetramethyldisiloxane, 1,1,1-triethyl-3,3,3-trimethyldisiloxane, 1,3-bis(3-methacryloxypropyl)tetramethyldisiloxane, 1,3-bis(chloromethyl)tetramethyldisiloxane, 1,1,3,3-tetramethyl-1,3-diethoxydisiloxane, 1,1,3,3-tetraphenyldimethyldisiloxane, methacryloxypentamethyldisiloxane, pentamethyldisiloxane, 1,3-bis(3-

chloropropyl)tetramethyldisiloxane, 1,3-bis(4-hydroxybutyl)tetramethyldisiloxane, 1,3-bis(triethoxysilylethyl)tetramethyldisiloxane, 3-aminopropylpentamethyldisiloxane, 1,3-bis(2-aminoethylaminomethyl)tetramethyldisiloxane, 1,3-bis(3-carboxypropyl)tetramethyldisiloxane, 1,3-dichloro-1,3-diphenyl-1,3-dimethyldisiloxane, 1,3-diethynyltetramethyldisiloxane, n-butyl-1,1,3,3-tetramethyldisiloxane, 1,3-dichlorotetraphenyldisiloxane, 1,3-dichlorotetramethyldisiloxane, 1,3-di-t-butyldisiloxane, 1,3-dimethyltetramethoxydisiloxane, 1,3-divinyltetraethoxydisiloxane, 1,1,3,3-tetraethoxy-1,3-dimethyldisiloxane, vinyl-1,1,3,3-tetramethyldisiloxane, platinum-[1,3-bis(cyclohexyl)imidazol-2-ylidene hexachlorodisiloxane, 1,1,3,3-tetraisopropyl-1-chlorodisiloxane, 1,1,1-trimethyl-3,3,3-triphenyldisiloxane, 1,3-bis(trimethylsiloxy)-1,3-dimethyldisiloxane, 3,3-diphenyltetramethyltrisiloxane, 3-phenylheptamethyltrisiloxane, hexamethylcyclotrisiloxane, n-propylheptamethyltrisiloxane, 1,5-diethoxyhexamethyltrisiloxane, 3-ethylheptamethyltrisiloxane, 3-(tetrahydrofurfuryloxypropyl)heptamethyltrisiloxane, 3-(3,3,3-trifluoropropyl)heptamethyltrisiloxane, 1,1,3,5,5-pentaphenyl-1,3,5-trimethyltrisiloxane, octamethyltrisiloxane, 1,1,5,5-tetraphenyl-1,3,3,5-tetramethyltrisiloxane, hexaphenylcyclotrisiloxane, 1,1,1,5,5,5-hexamethyltrisiloxane, octachlorotrisiloxane, 3-phenyl-1,1,3,5,5-pentamethyltrisiloxane, (3,3,3-trifluoropropyl)methylcyclotrisiloxane, 1,3,5-trivinyl-1,1,3,5,5-pentamethyltrisiloxane, 1,3,5-trivinyl-1,3,5-trimethylcyclotrisiloxane, 3-(3-acetoxypropyl)heptamethyltrisiloxane, 3-(m-pentadecylphenoxypropyl)heptamethyltrisiloxane, limonenyltrisiloxane, 3-dodecylheptamethyltrisiloxane, 3-octylheptamethyltrisiloxane, 1,3,5-triphenyltrimethylcyclotrisiloxane, 1,1,1,3,3,5,5-heptamethyltrisiloxane, 1,1,3,3,5,5-hexamethyltrisiloxane, 1,1,1,5,5,5-hexaethyl-3-methyltrisiloxane, 1,5-dichlorohexamethyltrisiloxane, 3-triacontylheptamethyltrisiloxane, 3-(3-hydroxypropyl)heptamethyltrisiloxane, hexamethylcyclomethylphosphonoxytrisiloxane, 3-octadecylheptamethyltrisiloxane, furfuryloxytrisiloxane, tetrakis(dimethylsiloxy)silane, 1,1,3,3,5,5,7,7-octamethyltetrasiloxane, 1,3-diphenyl-1,3-dimethyldisiloxane, octamethylcyclotetrasiloxane, 1,3-bis(trimethylsiloxy)-1,3-dimethyldisiloxane, bis(hydroxypropyl)tetramethyldisiloxane, tetra-n-propyltetramethylcyclotetrasiloxane, octaethylcyclotetrasiloxane, decamethyltetrasiloxane, dodecamethylcyclohexasiloxane, dodecamethylpentasiloxane, tetradecamethylhexasiloxane, hexaphenylcyclotrisiloxane,

polyoctadecylmethylsiloxane, decamethylcyclopentasiloxane, poly(3,3,3-trifluoropropylmethylsiloxane), or 1,1,3,3,5,5,7,7,9,9-decamethylpentasiloxane.

3. The composition of claim 1, wherein the at least one additive comprises methanesulfonic acid, trifluoromethanesulfonic acid, methanesulfonic anhydride, trifluoromethanesulfonic anhydride, acetic anhydride, perchloric acid, nitric acid, sulfuric acid, toluenesulfonic acid, dodecylbenzenesulfonic acid, hydroiodic acid, hydrobromic acid, hydrochloric acid, chloric acid, trichloroacetic acid, trifluoroacetic acid, or fluorosulfuric acid.

4. The composition of claim 1, further comprising at least one organic solvent.

5. The composition of claim 4, wherein the at least one organic solvent is selected from the group consist of anhydrides, glycol ethers, glycol ether acetates, alkanes, aromatic hydrocarbons, sulfones, sulfoxides, ketones, aldehydes, esters, lactams, lactones, acetals, hemiacetals, alcohols, carboxylic acids, and ethers.

6. The composition of claim 4, wherein the at least one organic solvent comprises acetic anhydride, propylene glycol methyl ether acetate, a C_6-C_{16} alkane, toluene, xylene, mesitylene, tetraethylene glycol dimethyl ether, propylene glycol dimethyl ether, ethylene glycol dimethyl ether, dipropylene glycol dimethyl ether, diethylene glycol dimethyl ether, dipropylene glycol dibutylether, n-dibutyl ether, dimethylsulfone, sulfolane, benzyl alcohol, t-butyl alcohol, t-amyl alcohol, methyl ethyl ketone, acetic acid, or isobutyl methyl ketone.

7. The composition of claim 4, wherein the at least one organic solvent is from about 3 wt% to about 95 wt% of the surface treatment composition.

8. The composition of claim 1, wherein the composition is substantially free of water.

9. The composition of claim 1, wherein the composition forms a surface treatment layer on a surface such that the surface treatment layer has a water contact angle of at least about 50 degrees.

10. A surface treatment composition, comprising:

at least one siloxane compound in an amount of from about 0.1 wt% to about 99.9 wt% of the surface treatment composition, wherein the at least one siloxane compound comprises a disiloxane, an oligosiloxane, a cyclosilxoane, or a polysiloxane;

at least one additive comprising a compound selected from the group consisting of sulfonic acids and sulfonic anhydrides and being in an amount of from about 0.1 wt% to about 10 wt% of the surface treatment composition; and

at least one carboxylic acid or anhydride in an amount of from about 3 wt% to about 95 wt% of the surface treatment composition.

11. An article, comprising:

a semiconductor substrate; and

the surface treatment composition of claim 1 supported by the semiconductor substrate.

12. The article of claim 11, wherein the semiconductor substrate is a silicon wafer, a copper wafer, a silicon dioxide wafer, a silicon nitride wafer, a silicon oxynitride wafer, a carbon doped silicon oxide wafer, a SiGe wafer, or a GaAs wafer.

13. A kit, comprising:

a first container comprising at least one siloxane compound, wherein the at least one siloxane compound comprises a disiloxane, an oligosiloxane, a cyclosilxoane, or a polysiloxane, provided that the at least one siloxane compound is not a polydimethylsiloxane; and

a second container comprising at least one additive, the at least one additive comprising an acid having a pKa of at most 0 or an anhydride thereof.

14. The composition of claim 10, wherein the at least one siloxane compound comprises hexamethyldisiloxane, 1,3-diphenyl-1,3-dimethyldisiloxane, 1,1,3,3-

tetramethyldisiloxane, 1,1,1-triethyl-3,3-dimethyldisiloxane, 1,1,3,3-tetra-n-octyldimethyldisiloxane, bis(nonafluorohexyl)tetramethyldisiloxane, 1,3-bis(trifluoropropyl)tetramethyldisiloxane, 1,3-di-n-butyltetramethyldisiloxane, 1,3-di-n-octyltetramethyldisiloxane, 1,3-diethyltetramethyldisiloxane, 1,3-diphenyltetramethyldisiloxane, hexa-n-butyldisiloxane, hexaethyldisiloxane, hexavinyldisiloxane, 1,1,1,3,3-pentamethyl-3-acetoxydisiloxane, 1-allyl-1,1,3,3-tetramethyldisiloxane, 1,3-bis(3-aminopropyl)tetramethyldisiloxane, 1,3-bis(heptadecafluoro-1,1,2,2-tetrahydrodecyl)tetramethyldisiloxane, 1,3-divinyltetraphenyldisiloxane, 1,3-divinyltetramethyldisiloxane, 1,3-diallyltetrakis(trimethylsiloxy)disiloxane, 1,3-diallyltetramethyldisiloxane, 1,3-diphenyltetrakis(dimethylsiloxy)disiloxane, (3-chloropropyl)pentamethyldisiloxane, 1,3-divinyltetrakis(trimethylsiloxy)disiloxane, 1,1,3,3-tetraisopropyldisiloxane, 1,1,3,3-tetravinyldimethyldisiloxane, 1,1,3,3-tetracyclopentyldichlorodisiloxane, vinylpentamethyldisiloxane, 1,3-bis(3-chloroisobutyl)tetramethyldisiloxane, hexaphenyldisiloxane, 1,3-bis[(bicyclo[2.2.1]hept-2-enyl)ethyl]tetramethyldisiloxane, 1,1,1-triethyl-3,3,3-trimethyldisiloxane, 1,3-bis(3-methacryloxypropyl)tetramethyldisiloxane, 1,3-bis(chloromethyl)tetramethyldisiloxane, 1,1,3,3-tetramethyl-1,3-diethoxydisiloxane, 1,1,3,3-tetraphenyldimethyldisiloxane, methacryloxypentamethyldisiloxane, pentamethyldisiloxane, 1,3-bis(3-chloropropyl)tetramethyldisiloxane, 1,3-bis(4-hydroxybutyl)tetramethyldisiloxane, 1,3-bis(triethoxysilylethyl)tetramethyldisiloxane, 3-aminopropylpentamethyldisiloxane, 1,3-bis(2-aminoethylaminomethyl)tetramethyldisiloxane, 1,3-bis(3-carboxypropyl)tetramethyldisiloxane, 1,3-dichloro-1,3-diphenyl-1,3-dimethyldisiloxane, 1,3-diethynyltetramethyldisiloxane, n-butyl-1,1,3,3-tetramethyldisiloxane, 1,3-dichlorotetraphenyldisiloxane, 1,3-dichlorotetramethyldisiloxane, 1,3-di-t-butyldisiloxane, 1,3-dimethyltetramethoxydisiloxane, 1,3-divinyltetraethoxydisiloxane, 1,1,3,3-tetraethoxy-1,3-dimethyldisiloxane, vinyl-1,1,3,3-tetramethyldisiloxane, platinum-[1,3-bis(cyclohexyl)imidazol-2-ylidene hexachlorodisiloxane, 1,1,3,3-tetraisopropyl-1-chlorodisiloxane, 1,1,1-trimethyl-3,3,3-triphenyldisiloxane, 1,3-bis(trimethylsiloxy)-1,3-dimethyldisiloxane, 3,3-diphenyltetramethyltrisiloxane, 3-phenylheptamethyltrisiloxane, hexamethylcyclotrisiloxane, n-propylheptamethyltrisiloxane, 1,5-diethoxyhexamethyltrisiloxane, 3-ethylheptamethyltrisiloxane, 3-(tetrahydrofurfuryloxypropyl)heptamethyltrisiloxane, 3-(3,3,3-

trifluoropropyl)heptamethyltrisiloxane, 1,1,3,5,5-pentaphenyl-1,3,5-trimethyltrisiloxane, octamethyltrisiloxane, 1,1,5,5-tetraphenyl-1,3,3,5-tetramethyltrisiloxane, hexaphenylcyclotrisiloxane, 1,1,1,5,5,5-hexamethyltrisiloxane, octachlorotrisiloxane, 3-phenyl-1,1,3,5,5-pentamethyltrisiloxane, (3,3,3-trifluoropropyl)methylcyclotrisiloxane, 1,3,5-trivinyl-1,1,3,5,5-pentamethyltrisiloxane, 1,3,5-trivinyl-1,3,5-trimethylcyclotrisiloxane, 3-(3-acetoxypropyl)heptamethyltrisiloxane, 3-(m-pentadecylphenoxypropyl)heptamethyltrisiloxane, limonenyltrisiloxane, 3-dodecylheptamethyltrisiloxane, 3-octylheptamethyltrisiloxane, 1,3,5-triphenyltrimethylcyclotrisiloxane, 1,1,1,3,3,5,5-heptamethyltrisiloxane, 1,1,3,3,5,5-hexamethyltrisiloxane, 1,1,1,5,5,5-hexaethyl-3-methyltrisiloxane, 1,5-dichlorohexamethyltrisiloxane, 3-triacontylheptamethyltrisiloxane, 3-(3-hydroxypropyl)heptamethyltrisiloxane, hexamethylcyclomethylphosphonoxytrisiloxane, 3-octadecylheptamethyltrisiloxane, furfuryloxytrisiloxane, tetrakis(dimethylsiloxy)silane, 1,1,3,3,5,5,7,7-octamethyltetrasiloxane, 1,3-diphenyl-1,3-dimethyldisiloxane, octamethylcyclotetrasiloxane, 1,3-bis(trimethylsiloxy)-1,3-dimethyldisiloxane, a dimethylsiloxane-[65-70%(60% propylene oxide/40% ethylene oxide)] block copolymer, bis(hydroxypropyl)tetramethyldisiloxane, tetra-n-propyltetramethylcyclotetrasiloxane, octaethylcyclotetrasiloxane, decamethyltetrasiloxane, dodecamethylcyclohexasiloxane, dodecamethylpentasiloxane, tetradecamethylhexasiloxane, hexaphenylcyclotrisiloxane, polydimethylsiloxane, polyoctadecylmethylsiloxane, hexacosyl terminated polydimethylsiloxane, decamethylcyclopentasiloxane, poly(3,3,3-trifluoropropylmethylsiloxane), trimethylsiloxy terminated polydimethylsiloxane, or 1,1,3,3,5,5,7,7,9,9-decamethylpentasiloxane, or triethylsiloxy terminated polydiethylsiloxane.

15. The composition of claim 10, wherein the at least one siloxane compound is from about 0.1 wt% to about 55 wt% of the surface treatment composition.

16. The composition of claim 10, wherein the at least one additive comprises methanesulfonic acid, trifluoromethanesulfonic acid, methanesulfonic anhydride, trifluoromethanesulfonic anhydride, toluenesulfonic acid, or dodecylbenzenesulfonic acid.

17. The composition of claim 10, wherein the at least one additive is from about 0.1 wt% to about 5 wt% of the surface treatment composition.

18. The composition of claim 10, wherein the at least one carboxylic acid or anhydride comprises acetic acid or acetic anhydride.

19. The composition of claim 10, wherein the at least one carboxylic acid or anhydride is from about 50 wt% to about 95 wt% of the surface treatment composition.

20. The composition of claim 10, wherein the composition is substantially free of water.

21. The composition of claim 10, wherein the composition forms a surface treatment layer on a surface such that the surface treatment layer has a water contact angle of at least about 50 degrees.

22. An article, comprising:

a semiconductor substrate; and

the surface treatment composition of claim 10 supported by the semiconductor substrate.

23. The article of claim 22, wherein the semiconductor substrate is a silicon wafer, a copper wafer, a silicon dioxide wafer, a silicon nitride wafer, a silicon oxynitride wafer, a carbon doped silicon oxide wafer, a SiGe wafer, or a GaAs wafer.