CLAIMS

1. A stripper solution for removing a resist from a substrate comprising the following ingredients:

60 wt % to 95 wt % of dimethyl sulfoxide,

water,

0.1 wt % to 5.0 wt % of hydroxylamine,

1.0 wt % of benzotriazole,

optionally 0.001 wt % to 1 wt % of one or more than one non-ionic surfactant,

optionally an additional corrosion inhibitor, and

1.75 wt % to 12.95 wt % of neat tetraethyl ammonium hydroxide,

wherein the stripper solution is free of fluorine-containing compounds and tetramethylammonium hydroxide, and

wherein the ingredients do not exceed 100 wt % of the solution.

2. The stripper solution of claim 1, wherein the stripper solution has a 5% pH of 11.39 to 12.69.

3. The stripper solution of claim 1, comprising 1.75 wt % of neat tetraethylammonium hydroxide.

4. The stripper solution of claim 1, comprising 3.5 wt % of neat tetraethylammonium hydroxide.

5. The stripper solution of claim 1, comprising 12.95 wt % of neat tetraethylammonium hydroxide.

6. The stripper solution of claim 1, comprising 1.75 wt % to 3.75 wt % of neat tetraethylammonium hydroxide.

7. The stripper solution of claim 1, comprising 3.75 wt % to 12.95 wt % of neat tetraethylammonium hydroxide.

8. The stripper solution of claim 1, comprising 1 wt % to 2.0 wt % of hydroxylamine.

9. The stripper solution of claim 1, comprising 1 wt % to 2.0 wt % of hydroxylamine and 3.5 wt % to 12.95 wt % of neat tetraethylammonium hydroxide.

10. The stripper solution of claim 9, comprising 60 wt % of dimethyl sulfoxide.

11. The stripper solution of claim 1, comprising the optional additional corrosion inhibitor, wherein the additional corrosion inhibitor is selected from the group consisting of carboxybenzotriazole, amino-benzotriazole, D-fructose, t-butyl catechol, L-ascorbic acid, vanillin, salicylic acid, diethyl hydroxylamine, poly(ethyleneimine), o-tolyltriazole, m tolyltriazole, and p-tolyltriazole and 2-mercaptobenzimidazole.

12. The stripper solution of claim 9, comprising 87 wt % of dimethyl sulfoxide.

13. The stripper solution of claim 1, comprising from 1 to 12.95 wt % of neat tetraethylammonium hydroxide and from 1 to 15 wt % water.

14. The stripper solution of claim 1, comprising the optional non-ionic surfactant, wherein the non-ionic surfactant selected from the group consisting of bis(2-ethylhexyl)phosphate, perfluoroheptanoic acid, prefluorodecanoic acid, trifluoromethanesulfonic acid, phosphonoacetic acid, dodecenylsuccinic acid, dioctadecyl hydrogen phosphate, octadecyl dihydrogen phosphate, dodecylamine, dodecenylsuccinic acid monodiethanol amide, lauric acid, palmitic acid, oleic acid, juniperic acid, 12 hydroxystearic acid, dodecyl phosphate and acetylene glycol surfactant.

15. The stripper solution of claim 1, wherein water comprises from 3.5 wt % to 9 wt % of the composition; and the hydroxylamine comprises more than or equal to 1 wt % but less than or equal to 2 wt % of the composition.

16. A method for removing a resist from a substrate comprising: (a) providing a substrate having a resist thereon; (b) contacting the substrate with a stripper solution for a time sufficient to remove the resist; (c) removing the substrate from the stripper solution; and (d) rinsing the stripper solution from the substrate with a solvent, wherein the step of contacting the substrate with a stripper solution involves contacting the substrate with a stripper solution of any of the preceding claims.

17. The method of claim 16, wherein contacting the substrate with a stripper solution includes immersing the substrate in the stripper solution with agitation at a temperature of at least 40 ºC.

18. The method of claim 16, wherein contacting the substrate with a stripper solution includes immersing the substrate in the stripper solution with agitation at a temperature of less than 40 ºC.

19. The method of claim 16, wherein contacting the substrate with a stripper solution includes spraying the stripper solution onto the substrate, wherein the stripper solution is at a temperature of at least 40 ºC.

20. The method of claim 16, wherein contacting the substrate with a stripper solution includes spraying the stripper solution onto the substrate, wherein the stripper solution is at a temperature of less than 40 ºC.

21. The method of claim 16, wherein providing a substrate having a resist thereon, involves providing a substrate having a resist which is a bilayer resist having two polymer layers.

22. The method of claim 16, wherein providing a substrate having a resist thereon, involves providing a substrate having a resist which is a bilayer resist having one inorganic layer and one polymer layer.

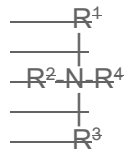
23. A method for preparing a stripper solution, the method comprising: (a) providing a container; (b) providing components of the stripper solution; and (c) adding said components of said stripper solution to said container to provide contents, wherein said providing components involves providing the following ingredients:

60 wt % to 95 wt % of dimethyl sulfoxide,
water,
0.1 wt % to 5.0 wt % of hydroxylamine,
1.0 wt % of benzotriazole,
optionally 0.001 wt % to 1 wt % of one or more than one non-ionic surfactant,
optionally an additional corrosion inhibitor, and
1.75 wt % to 12.95 wt % of neat tetraethyl ammonium hydroxide,

wherein the stripper solution is free of fluorine-containing compounds and tetramethylammonium hydroxide, and

wherein the ingredients do not exceed 100 wt % of the solution.

~~1. A stripper solution for removing a resist from a substrate comprising copper, the stripper solution comprising one or more than one organic solvent, water, hydroxylamine or one or more than one derivative of hydroxylamine, one or more than one corrosion inhibitor, optional one or more than one surfactant, and one or more than one quaternary ammonium hydroxide, wherein the quaternary ammonium hydroxide has the formula:~~



~~where R^1, R^2, R^3 and R^4 are alkyl groups, benzyl, aryl groups, or a combination thereof having collectively at least 5 carbons,~~

~~wherein the corrosion inhibitor is selected from the group consisting of aromatic hydroxyl compounds, acetylenic alcohols, carboxyl group-containing organic compounds and anhydrides thereof, triazole compounds and imidazole compounds,~~

~~wherein the stripper solution comprises from 2.5 to 20 wt% of the quaternary ammonium hydroxide.~~

~~2. The stripper solution of claim 1 wherein R^1, R^2, R^3 and R^4 are C_1-C_8 alkyl groups, C_1-C_8 benzyl, C_1-C_8 aryl groups, or a combination thereof.~~

~~3. The stripper solution of claim 1, wherein the quaternary ammonium hydroxide is selected from the group consisting of ethyltrimethylammonium hydroxide, benzyltrimethylammonium hydroxide, tetraethylammonium hydroxide, and tetrabutylammonium hydroxide.~~

~~4. The stripper solution of claim 1, wherein the stripper solution is substantially free of tetramethylammonium hydroxide.~~

~~5. The stripper solution of claim 1, wherein the stripper solution comprises from 2.5 to 7 wt% quaternary ammonium hydroxide, or wherein the stripper solution comprises from 2.5 to 4 wt% quaternary ammonium hydroxide, or wherein the stripper solution comprises from 2.5 to 3.75 wt% quaternary ammonium hydroxide.~~

6. The stripper solution of claim 1, wherein the organic solvent is selected from the group consisting of dimethylsulfoxide, N-methyl-2-pyrrolidone, N,N-dimethylacetamide, N,N-dimethylformamide, N,N-dimethylimidazole, γ-butyrolactone, sulfolane, 2-pyrrolidinone, 1-methyl-2-pyrrolidinone, 1-ethyl-2-pyrrolidinone, 1-propyl-2-pyrrolidinone, 1-hydroxyethyl-2-pyrolidinone, 1-hydroxypropyl-2-pyrrolidinone, diethylene glycol monoalkyl ethers, dialkyl sulfones, tetrahydrothiophene-1,1-dioxides, polyethylene glycol, and preferably wherein the organic solvent is dimethyl sulfoxide.

7. The stripper solution of claim 1, wherein the composition comprises from 20% to 97% of the solvent, or wherein the composition comprises from 40% to 95% of the solvent, or wherein the composition comprises from 60% to 90% of the solvent.

8. The stripper solution of claim 1 comprising hydroxylamine.

9.The stripper solution of claim 1, comprising hydroxylamine derivative.

10. The stripper solution of claim 1, wherein said hydroxylamine derivative is selected from the group consisting of diethyl hydroxylamine (DEHA), isopropyl hydroxylamine or salts of hydroxylamine.

11. The stripper solution of claim 1, wherein said composition comprises hydroxylamine or one or more than one hydroxylamine derivative or mixtures thereof in amount of from 0.1 to 10 wt %, or in amount of from 0.1 to 5 wt %, or in amount of from 0.1 to 1.8 wt %.

12. The stripper solution of claim 1, wherein said composition comprises water in an amount from 1 to 30 wt %, or in an amount from 1 to 8 wt %, or in an amount from 3.5 to 9 wt %, or in an amount from 4.4 to 8 wt %.

13. The stripper solution of claim 1,
wherein the corrosion inhibitor is selected from the group consisting of benzotriazole, carboxybenzotriazole, amino-benzotriazole, D-fructose, t-butyl catechol, L-ascorbic acid, vanillin, salicylic acid, and 2-mercaptobenzimidazole, or wherein the corrosion inhibitor is selected from the group consisting of benzotriazole, o-tolyltriazole, m-tolyltriazole, and p-tolyltriazole, or wherein the corrosion inhibitor comprises benzotriazole.

~~14. The stripper solution of claim 1, wherein the stripper solution comprises from 0.1 to 15 wt % of said corrosion inhibitor, or wherein the stripper solution comprises from 0.1 to 10 wt % of said corrosion inhibitor, or wherein the stripper solution comprises from 0.5 to 5 wt %of said corrosion inhibitor, or wherein the stripper solution comprises from 0.1 to 1 wt% of said corrosion inhibitor.~~

~~15. The stripper solution of claim 1 comprising surfactant, wherein the surfactant is selected from the group consisting of amphoteric salts, cationic surfactants, anionic surfactants, zwitterionic surfactants, non-ionic surfactants, and combinations thereof, or wherein the surfactant is selected from the group consisting of bis(2-ethylhexyl)phosphate, perfluoroheptanoic acid, prefluorodecanoic acid, trifluoromethanesulfonic acid, phosphonoacetic acid, dodecenylsuccinic acid, dioctadecyl hydrogen phosphate, octadecyl dihydrogen phosphate, dodecylamine, dodecenylsuccinic acid monodiethanol amide, lauric acid, palmitic acid, oleic acid, juniperic acid, 12 hydroxystearic acid and dodecyl phosphate.~~

~~16. The stripper solution of claim 1, wherein the stripper solution comprises from 0.001 to 15 wt% of said one or more than one surfactant, or wherein the stripper solution comprises from 0.1 to 1 wt% of said one or more than one surfactant, or wherein the stripper solution comprises from 0.001 to 1 wt% of said one or more than one surfactant, or wherein the stripper solution comprises from 0.5 to 5 wt% of said one or more than one surfactant.~~

~~17. The stripper solution of claim 1, wherein the solvent comprises from 80% to 93% of the composition; water comprises from 3.5 wt% to 9 wt% of the composition; the quaternary ammonium hydroxide comprises from 2.5 wt% to 5 wt% of the composition; and the hydroxylamine or hydroxylamine derivative or mixture thereof comprises more than zero but less than 2 wt%, the corrosion inhibitor comprises from 0.1 to 5 wt%, and the surfactant comprises from 0.01 to 5 wt % of the composition, or wherein the solvent comprises from 80% to 90% of the composition; water comprises from 3.5 wt% to 8 wt% of the composition; the quaternary ammonium hydroxide comprises from 2.5 wt% to 5 wt% of the composition; and the hydroxylamine or hydroxylamine derivative or mixture thereof comprises from 0.5 but to 1.5 wt%, the corrosion inhibitor comprises from 0.1 to 5 wt%, and the surfactant comprises from 0.01 to 3 wt % of the composition.~~

~~18. A method for removing a resist from a substrate comprising: (a) providing a substrate having a resist thereon; (b) contacting the substrate with a stripper solution for a time sufficient~~

to remove the resist; (c) removing the substrate from the stripping solution; and (d) rinsing the stripper solution from the substrate with a solvent, wherein the step of contacting the substrate comprises contacting the substrate with a stripper solution of any of the preceding claims.

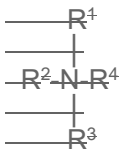
19. The method of claim 18, wherein contacting the substrate with a stripper solution includes immersing the substrate in the stripping solution with agitation at a temperature of at least about 40 ºC or at a temperature of less than 40 ºC.

20. The method of claim 18, wherein contacting the substrate with a stripper solution includes spraying the stripper solution onto the substrate, wherein the stripper solution is at a temperature of at least about 40 ºC, or is at a temperature of less than about 40 ºC.

21. The method of claim 18, wherein contacting the substrate with a stripper solution includes contacting the substrate with a stripper solution substantially free of tetramethylammonium hydroxide.

22. The method of claim 18, wherein providing a substrate having a resist thereon, involves providing a substrate having a resist which is a bilayer resist having two polymer layers, or is a bilayer resist having one inorganic layer and one polymer layer.

23. A method for preparing a stripper solution for removing a resist from a substrate comprising copper, the method comprising: (a) providing a container; (b) providing components of the stripper solution composition; and (c) adding said components of said stripper solution to said container to provide contents, wherein said providing components involves providing one or more than one organic solvent, water, one or more than one corrosion inhibitor, hydroxylamine or one or more than one hydroxylamine derivative or mixtures thereof, optional one or more than one surfactant and one or more than one quaternary ammonium hydroxide, the one or more than one quaternary ammonium hydroxide having the formula:



where R^1, R^2, R^3 and R^4 are alkyl groups, benzyl, aryl groups, or a combination thereof having collectively at least 5 carbons,

wherein the corrosion inhibitor is selected from the group consisting of aromatic hydroxyl compounds, acetylenic alcohols, carboxyl group-containing organic compounds and anhydrides thereof, triazole compounds and imidazole compounds,

wherein the stripper solution comprises from 2.5 to 20 wt% of the quaternary ammonium hydroxide.