CLAIMS

What is claimed:

1. A chemical-mechanical polishing composition for polishing cobalt and/or tungsten, comprising:

at least one abrasive;

at least one organic acid;

at least one azole containing compound;

a first amine compound comprising a 6-24 carbon alkyl chain

a second amine compound, wherein the second amine compound comprises an aminoalcohol;

an aqueous solvent;

a pH adjuster selected from the group consisting of tetrabutylammonium hydroxide, tetrapropylammonium hydroxide, tetraethylammonium hydroxide, tetramethylammonium hydroxide, ethyltrimethylammonium hydroxide, diethyldimethylammonium hydroxide, dimethyldipropylammonium hydroxide, benzyltrimethylammonium hydroxide, tris(2-hydroxyethyl)methylammonium hydroxide, choline hydroxide, and any combinations thereof; and

optionally, at least one anionic surfactant,

wherein the pH of the composition is between 1 to 7.

2. The polishing composition of claim 1, wherein the at least one abrasive is selected from the group consisting of alumina, silica, titania, ceria, zirconia, co-formed products of alumina, silica, titania, ceria, or zirconia, coated abrasives, surface modified abrasives, and mixtures thereof.

3. The polishing composition of claim 1, wherein the at least one abrasive is in an amount of from 0.01% to 25% by weight of the composition.

4. The polishing composition of claim 1, wherein the organic acid may be selected from the group consisting of a carboxylic acid, an amino acid, an organic sulfonic acid, an organic phosphonic acid or mixtures thereof.

5. The polishing composition of claim 1, wherein the at least one organic acid is selected from the group consisting of gluconic acid, lactic acid, citric acid, tartaric acid, malic acid, glycolic acid, malonic acid, formic acid, oxalic acid, acetic acid, propionic acid, peracetic acid, succinic acid, lactic acid, amino acetic acid, phenoxyacetic acid, bicine, diglycolic acid, glyceric acid, tricine, alanine, histidine, valine, phenylalanine, proline, glutamine, aspartic acid, glutamic acid, arginine, lysine, tyrosine, benzoic acid, 1,2-ethanedisulfonic acid, 4-amino-3-hydroxy-1-naphthalenesulfonic acid, 8-hydroxyquinoline-5-sulfonic acid, aminomethanesulfonic acid, benzenesulfonic acid, hydroxylamine O-sulfonic acid, methanesulfonic acid, m-xylene-4-sulfonic acid, poly(4-styrenesulfonic acid), polyanetholesulfonic acid, p-toluenesulfonic acid, trifluoromethane-sulfonic acid, ethyl phosphoric acid, cyanoethyl phosphoric acid, phenyl phosphoric acid, vinyl phosphoric acid, poly(vinylphosphonic acid), 1-hydroxyethane-1,1-diphosphonic acid, nitrilotri(methylphosphonic acid), diethylenetriaminepentakis (methylphosphonic acid), N,N,N'N'-ethylenediaminetetrakis(methylene phosphonic acid), n-hexylphosphonic acid, benzylphosphonic acid, phenylphosphonic acid, salts thereof, and mixtures thereof.

6. The polishing composition of claim 1, wherein the at least one organic acid is in an amount of from 0.01% to 1% by weight of the composition.

7. The polishing composition of claim 1, wherein the anionic surfactant is selected from the group consisting of carboxylic acid salts, sulfonic acid salts, sulfate salts, phosphate salts, phosphonate salts, sarcosinate salts, or mixtures thereof.

8. The polishing composition of claim 1, wherein the anionic surfactant comprises a sulphonate group.

9. The polishing composition of claim 1, wherein the at least one anionic surfactant is selected from the group consisting of an alkyl sulphonate, an alkylaryl sulphonate, a polyoxyethylene alkyl ether sulphonate, a polyoxyethylene aryl alkyl ether sulphonate, a polyoxyethylene nonylaryl ether sulphonate, a polyoxyethylene nonylphenyl ether sulphonate, and mixtures thereof.

10. The polishing composition of claim 1, wherein the anionic surfactant is in an amount of from 0.001% to 0.5% by weight of the composition.

11. The polishing composition of claim 1, wherein the at least one azole is selected from the group consisting of heterocyclic azoles, substituted or unsubstituted triazoles, substituted or unsubstituted tetrazoles, substituted or unsubstituted diazoles, and substituted or unsubstituted benzothiazoles.

12. The polishing composition of claim 1, wherein the at least one azole is selected from the group consisting of tetrazole, benzotriazole, tolyltriazole, methyl benzotriazole, ethyl benzotriazole, propyl benzotriazole, butyl benzotriazole, pentyl benzotriazole, hexyl benzotriazole, dimethyl benzotriazole, chloro benzotriazole, dichloro benzotriazole, chloromethyl benzotriazole, chloroethyl benzotriazole, phenyl benzotriazole, benzyl benzotriazole, aminotriazole, aminobenzimidazole, pyrazole, imidazole, aminotetrazole, adenine, benzimidazole, thiabendazole, 1,2,3-triazole, 1,2,4-triazole, 1-hydroxybenzotriazole, 2-methylbenzothiazole, 2-aminobenzimidazole, 2-amino-5-ethyl-1,3,4-thiadiazole, 3,5-diamino-1,2,4-triazole, 3-amino-5-methylpyrazole, 4-amino-4H-1,2,4-triazole, aminotetrazole, tetrazole, phenyltetrazole, phenyl-tetrazole-5-thiol, and combinations thereof.

13. The polishing composition of claim 1, wherein the at least one azole is in an amount of from 0.001% to 0.5% by weight of the composition.

14. The polishing composition of claim 1, wherein the first amine compound has a 6-18 carbon alkyl chain.

15. The polishing composition of claim 1, wherein the first amine compound is in an amount of from 0.0005% to 0.5% by weight of the composition.

16. The polishing composition of claim 1, wherein the second amine compound is a β-hydroxyl-alkylamine or a derivative thereof.

17. The polishing composition of claim 1, wherein the second amine compound is selected from the group consisting of ethanolamine, diethanolamine, 2-amino-3-hexanol, 2-amino-

2-methyl-3-hexanol, 2-amino-2-methyl-3-heptanol, 2-amino-4-ethyl-3-octanol, 2-amino-3-heptanol,2-amino-1-phenylbutanol, 3-Amino-4-octanol, 2-Dimethylamino-2-methyl-1-propanol, 2-Amino-1-butanol, 2-amino-2-ethylpropanediol,2-Amino-2-methyl-1-propanol, 2-Methylamino-2-methyl-1-propanol, 1-amino-2-propanol, bis(2-hydroxypropyl)amine, tris(2-hydroxypropyl)amine, bis(2-hydroxyethyl)amine, tris(2-hydroxyethyl)amine, 2-(2-aminoethoxy)ethanol, or mixtures thereof.

18. The polishing composition of claim 1, wherein the second amine compound is in an amount of from 0.001% to 0.5% by weight of the composition.

19. The polishing composition of claim 1, further comprising:
an organic solvent in an amount of from 0.01% to 5% by weight of the composition.

20. The polishing composition of claim 19, wherein the organic solvent is selected from the group consisting of ethanol, 1-propanol, 2-propanol, n-butanol, propylene glycol, 2-methoxyethanol, 2-ethoxyethanol, propylene glycol propyl ether, ethylene glycol, and any combinations thereof.

21. The polishing composition of claim 1, wherein the polishing composition does not include an oxidizing agent.

22. A chemical-mechanical polishing composition for polishing cobalt and/or tungsten, comprising:
at least one abrasive;
at least one organic acid;
at least one azole containing compound;
a first amine compound comprising a 6-24 carbon alkyl chain;
a second amine compound comprising an aminoalcohol;
an aqueous solvent;
and a pH adjuster selected from the group consisting of tetrabutylammonium hydroxide, tetrapropylammonium hydroxide, tetraethylammonium hydroxide, tetramethylammonium hydroxide, ethyltrimethylammonium hydroxide, diethyldimethylammonium hydroxide, dimethyldipropylammonium hydroxide,

benzyltrimethylammonium hydroxide, tris(2-hydroxyethyl)methylammonium hydroxide, choline hydroxide, and any combinations thereof,

wherein the pH of the composition is between 1 to 7.

23. A polishing composition comprising:

at least one abrasive;

at least one organic acid;

an anionic surfactant;

at least one azole containing compound;

a first amine compound comprising a 6-24 carbon alkyl chain;

a second amine compound comprising an aminoalcohol;

an aqueous solvent; and

a pH adjuster selected from the group consisting of tetrabutylammonium hydroxide, tetrapropylammonium hydroxide, tetraethylammonium hydroxide, tetramethylammonium hydroxide, ethyltrimethylammonium hydroxide, diethyldimethylammonium hydroxide, dimethyldipropylammonium hydroxide, benzyltrimethylammonium hydroxide, tris(2-hydroxyethyl)methylammonium hydroxide, choline hydroxide, and any combinations thereof,

wherein the pH of the composition is between 1 to 7.

24. A method of polishing a substrate, comprising the steps of:

applying the polishing composition of any of claims 1-23 to a substrate comprising a metal on a surface of the substrate; and

bringing a pad into contact with the surface of the substrate and moving the pad in relation to the substrate.

25. The method of polishing a substrate of claim 24, wherein the metal is at least one of cobalt and tungsten.