CLAIMS:

1. A polishing composition, comprising:

at least one abrasive;

at least one first corrosion inhibitor that comprises at least one of alkyl phosphates, aromatic phosphates, alkyl phosphonates, or aromatic phosphonates;

at least one complexing agent;

at least one second corrosion inhibitor, the at least one second corrosion inhibitor comprising at least one azole compound; and

optionally at least one pH adjuster;

wherein the amount of the at least one first corrosion inhibitor in the polishing composition is from 1 ppm to 2000 ppm of the composition and is an amount such that:

i) the polishing composition dissolves from at least 3% by weight to at most 10% by weight Cu_2O from a solid Cu_2O powder at a weight ratio of Cu_2O to polishing composition of 1:2500 when the solid Cu_2O powder has an average particle size of from 0.01 micron to 500 microns and is immersed in the polishing composition at 25°C for two minutes under agitation to form a mixture, the mixture is centrifuged to form a supernatant, and the amount of Cu ions dissolved in the supernatant is measured by ICP-MS, and/or

ii) when a 4 cm x 4 cm copper containing patterned coupon is immersed in 50 g of the polishing composition at 45°C for 5 minutes to form a mixture, the amount of the Cu species in the mixture is from 1 ppm to 10 ppm as measured by ICP-MS.

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 50% by weight of the composition.

4. The polishing composition of claim 1, wherein the at least one first corrosion inhibitor comprises a phosphate group and comprises at least one of alkyl phosphates, aromatic phosphates, polyoxyethylene alkyl ether phosphates, polyoxyethylene aryl alkyl ether phosphates, polyoxyethylene nonylaryl ether phosphates, and polyoxyethylene nonylphenyl ether phosphates.

5. The polishing composition of claim 4, wherein the at least one first corrosion inhibitor comprises an alkyl chain with 8 to 22 carbons that is separated from the phosphate group by 2 to 16 ethylene oxide groups.

6. The polishing composition of claim 1, wherein the at least one first corrosion inhibitor comprises a phosphonate group and comprises at least one of alkyl phosphonates, aromatic phosphonates, polyoxyethylene alkyl ether phosphonates, polyoxyethylene aryl alkyl ether phosphonates, polyoxyethylene nonylaryl ether phosphonates, and polyoxyethylene nonylphenyl ether phosphonates.

7. The polishing composition of claim 1, wherein the amount of the at least one first corrosion inhibitor is from 2.5 ppm to 1000 ppm of the composition.

8. The polishing composition of claim 1, wherein the at least one first corrosion inhibitor has a molecular weight from 150 g/mol to 1100 g/mol.

9. The polishing composition of claim 1, wherein the at least one complexing agent is selected from the group consisting of organic acids, amines, ammonia, quaternary ammonium compounds, inorganic acids, and salts and mixtures thereof.

10. The polishing composition of claim 1, wherein the at least one complexing agent 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, ammonia, 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.

11. The polishing composition of claim 1, wherein the at least one complexing agent is in an amount from 0.01% to 20% by weight of the composition.

12. The polishing composition of claim 1, wherein the at least one second corrosion inhibitor is selected from the group consisting of tetrazole, benzotriazole, tolyltriazole, 5-methylbenzotriazole, 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-thiadazole, 3,5-diamino-1,2,4-triazole, 3-amino-5-methylpyrazole, 4-amino-4H-1,2,4-triazole, and combinations thereof.

13. The polishing composition of claim 1, wherein the at least one second corrosion inhibitor is in an amount from 0.0001% to 5% by weight of the composition.

14. A method of polishing a substrate, comprising:

contacting copper on a surface of the substrate with the polishing composition of claim 1.