CLAIM(S):

What is claimed is:

1. A chemical-mechanical polishing composition comprising:

a water based liquid carrier;

colloidal silica abrasive particles dispersed in the liquid carrier;

an aminosilane compound or a phosphonium silane compound incorporated in the colloidal silica abrasive particles internal to an outer surface thereof;

an iron containing accelerator; and

a pH in a range from about 1.5 to about 7.

2. The composition of claim 1, wherein the colloidal silica abrasive particles have a permanent positive charge of at least 10 mV.

3. The composition of claim 1, wherein the colloidal silica abrasive particles have a permanent positive charge of at least 15 mV.

4. The composition of claim 1, wherein the colloidal silica abrasive particles have a mean particle size in a range from about 30 to about 70 nm.

5. The composition of claim 1, comprising from about 0.2 to about 2 weight percent of the colloidal silica abrasive particles.

6. The composition of claim 1, comprising from about 1 to about 4 weight percent of the colloidal silica abrasive particles.

7. The composition of claim 1, wherein 30 percent or more of the colloidal silica abrasive particles include three or more aggregated primary particles.

8. The composition of claim 1, wherein 50 percent or more of the colloidal silica abrasive particles include three or more aggregated primary particles and 20 percent or more of the colloidal silica abrasive particles are monomers or dimers.

9. The composition of claim 1, wherein the aminosilane compound comprises a propyl group, primary amine, or quaternary amine.

10. The composition of claim 1, wherein the aminosilane compound comprises bis(2-hydroxyethyl)-3-aminopropyl trialkoxysilane, diethylaminomethyltrialkoxysilane, (N,N-diethyl-3-aminopropyl)trialkoxysilane), 3-(N-styrylmethyl-2-aminoethylaminopropyl trialkoxysilane, aminopropyl trialkoxysilane, (2-N-benzylaminoethyl)-3-aminopropyl trialkoxysilane), trialkoxysilyl propyl-N,N,N-trimethyl ammonium, N-(trialkoxysilylethyl)benzyl-N,N,N-trimethyl ammonium, (bis(methyldialkoxysilylpropyl)-N-methyl amine, bis(trialkoxysilylpropyl)urea, bis(3-(trialkoxysilyl)propyl)-ethylenediamine, bis(trialkoxysilylpropyl)amine, bis(trialkoxysilylpropyl)amine, 3-aminopropyltrialkoxysilane, N-(2-aminoethyl)-3-aminopropylmethyldialkoxysilane, N-(2-aminoethyl)-3-aminopropyltrialkoxysilane, 3-aminopropylmethyldialkoxysilane, 3-aminopropyltrialkoxysilane, (N-trialkoxysilylpropyl)polyethyleneimine, trialkoxysilylpropyldiethylenetriamine, N-phenyl-3-aminopropyltrialkoxysilane, N-(vinylbenzyl)-2-aminoethyl-3-aminopropyltrialkoxysilane, 4-aminobutyltrialkoxysilane, or a mixture thereof.

11. The composition of claim 1, having a pH in a range from about 2.0 to about 4.5.

12. The composition of claim 1, wherein the iron containing accelerator comprises a soluble iron containing catalyst.

13. The composition of claim 12, further comprising a stabilizer bound to the soluble iron containing catalyst, the stabilizer being selected from the group consisting of phosphoric acid, acetic acid, phthalic acid, citric acid, adipic acid, oxalic acid, malonic acid, aspartic acid, succinic acid, glutaric acid, pimelic acid, suberic acid, azelaic acid, sebacic acid, maleic acid, glutaconic acid, muconic acid, ethylenediaminetetraacetic acid, propylenediaminetetraacetic acid, and mixtures thereof.

14. The composition of claim 12, further comprising a hydrogen peroxide oxidizer.

15. The composition of claim 1, having an electrical conductivity of less than 1000 μS/cm.

16. The composition of claim 1, further comprising an amine compound in solution in the liquid carrier.

17. The composition of claim 16, wherein the amine compound comprises an alkyl group having 12 or more carbon atoms; a polyquaternary amine compound; or an amine containing polymer having four or more amine groups.

18. The composition of claim 1, wherein the colloidal silica abrasive particles have a core-shell structure in which an outer shell is disposed over an inner core, the aminosilane compound being incorporated in the outer shell.

19. The composition of claim 1, wherein the colloidal silica abrasive particles have a density of greater than 1.90 g/cm^3.

20. The composition of claim 1, wherein a molar ratio of the aminosilane compound to silica in the colloidal silica abrasive particles is less than 10 percent.

21. The composition of claim 1, wherein:

the colloidal silica abrasive particles have a permanent positive charge of at least 10 mV;

the iron containing accelerator comprises a soluble iron containing catalyst;

the composition further comprises a stabilizer bound to the soluble iron containing catalyst;

the composition further comprises an amine compound in solution in the liquid carrier;

30 percent or more of the colloidal silica abrasive particles include three or more aggregated primary particles; and

the composition has a pH in a range from about 2 to about 3.5.

22. The composition of claim 21, further comprising from about 0.2 to about 2 weight percent of the colloidal silica abrasive particles.

23. The composition of claim 1, wherein:

the colloidal silica abrasive particles have a permanent positive charge of at least 10 mV;

the iron containing accelerator comprises a soluble iron containing catalyst;

the composition further comprises a stabilizer bound to the soluble iron containing catalyst;

the composition further comprises an amine compound in solution in the liquid carrier;

30 percent or more of the colloidal silica abrasive particles include three or more aggregated primary particles; and

the composition has a pH in a range from about 3 to about 4.5 and an electrical conductivity of less than about 1000 μS/cm.

24. The composition of claim 23, further comprising from about 1 to about 4 weight percent of the colloidal silica abrasive particles.

25. A chemical-mechanical polishing composition comprising:

a water based liquid carrier;

colloidal silica abrasive particles dispersed in the liquid carrier;

a chemical species incorporated in the colloidal silica abrasive particles internal to an outer surface thereof, wherein the chemical species is a nitrogen-containing compound or a phosphorus-containing compound, wherein the colloidal silica abrasive particles have a permanent positive charge of at least 15 mV;

an iron containing accelerator; and

a pH in a range from about 2 to about 4.5;

wherein the chemical species is not an aminosilane.

26. The composition of claim 25, wherein 30 percent or more of the colloidal silica abrasive particles include three or more aggregated primary particles.

27. The composition of claim 25, wherein 50 percent or more of the colloidal silica abrasive particles include three or more aggregated primary particles and 20 percent or more of the colloidal silica abrasive particles are monomers or dimers.

28. The composition of claim 25, wherein the aminosilane compound comprises a propyl group, primary amine, or quaternary amine.

29. The composition of claim 25, wherein the iron containing accelerator comprises a soluble iron containing catalyst.

30. The composition of claim 29, further comprising a stabilizer bound to the soluble iron containing catalyst, the stabilizer being selected from the group consisting of

phosphoric acid, acetic acid, phthalic acid, citric acid, adipic acid, oxalic acid, malonic acid, aspartic acid, succinic acid, glutaric acid, pimelic acid, suberic acid, azelaic acid, sebacic acid, maleic acid, glutaconic acid, muconic acid, ethylenediaminetetraacetic acid, propylenediaminetetraacetic acid, and mixtures thereof.

31. The composition of claim 29, further comprising a hydrogen peroxide oxidizer.

32. The composition of claim 25, further comprising an amine compound in solution in the liquid carrier.

33. The composition of claim 25, wherein the colloidal silica abrasive particles have a core-shell structure in which an outer shell is disposed over an inner core, the chemical species being incorporated in the outer shell.

34. The composition of claim 25, wherein a molar ratio of the chemical species to silica in the colloidal silica abrasive particles is less than 10 percent.

35. The composition of claim 25, wherein:

the colloidal silica abrasive particles have a permanent positive charge of at least 10 mV;

the iron containing accelerator comprises a soluble iron containing catalyst;

the composition further comprises a stabilizer bound to the soluble iron containing catalyst;

the composition further comprises an amine compound in solution in the liquid carrier;

30 percent or more of the colloidal silica abrasive particles include three or more aggregated primary particles;

the composition comprising from about 0.2 to about 2 weight percent of the colloidal silica abrasive particles; and

the composition has a pH in a range from about 2 to about 3.5.

36. The composition of claim 25, wherein:

the colloidal silica abrasive particles have a permanent positive charge of at least 10 mV;

the iron containing accelerator comprises a soluble iron containing catalyst;

the composition further comprises a stabilizer bound to the soluble iron containing catalyst;

the composition further comprises an amine compound in solution in the liquid carrier;

30 percent or more of the colloidal silica abrasive particles include three or more aggregated primary particles;

the composition comprising from about 1 to about 4 weight percent of the colloidal silica abrasive particles; and

the composition has a pH in a range from about 3 to about 4.5 and an electrical conductivity of less than about 1000 μS/cm.