BRIEF SUMMARY OF THE INVENTION

[0004] The ~~invention~~ disclosure provides a method of chemically-mechanically polishing a substrate, which method comprises (i) providing a substrate comprising at least one layer of nickel-phosphorous, (ii) providing a polishing pad, (iii) providing a polishing composition comprising (a) wet-process silica, (b) an oxidizing agent that oxidizes nickel-phosphorous, (c) a chelating agent, (d) polyvinyl alcohol, (c) water, wherein the polishing composition has a pH of 1 to 4, (iv) contacting a surface of the substrate with the polishing pad and the polishing composition, and (v) abrading at least a portion of the surface of the substrate to remove at least some nickel-phosphorous from the surface of the substrate and to polish the surface of the substrate.

In one aspect, there is provided a method of chemically-mechanically polishing a memory or rigid disk substrate, which method comprises: (i) providing a memory or rigid disk substrate comprising at least one layer of nickel-phosphorous, (ii) providing a polishing pad, (iii) providing a polishing composition comprising: (a) wet-process silica, (b) an oxidizing agent that oxidizes nickel-phosphorous, (c) a chelating agent, (d) polyvinyl alcohol, wherein the polyvinyl alcohol has a degree of hydrolysis of about 90% or more, (e) water, wherein the polishing composition has a pH of about 1 to about 4, (iv) contacting a surface of the substrate with the polishing pad and the polishing composition, and (v) abrading at least a portion of the surface of the substrate to remove at least some nickel-phosphorous from the surface of the substrate and to polish the surface of the substrate.

In another aspect, there is provided a method of chemically-mechanically polishing a memory or rigid disk substrate, which method comprises: (i) providing a memory or rigid disk substrate, (ii) providing a polishing pad, (iii) providing the polishing composition comprising: (a) wet-process silica, (b) an oxidizing agent that oxidizes nickel-phosphorous, (c) a chelating agent, (d) polyvinyl alcohol, wherein the polyvinyl alcohol has a molecular weight of about 8,000 g/mol to about 50,000 g/mol, (e) water, wherein the polishing composition has a pH of about 1 to about 4, and wherein the polishing composition does not comprise a heterocyclic compound, (iv) contacting a surface of the substrate with the polishing pad and the polishing composition, and (v) abrading at least a portion of the surface of the substrate to remove at least some portion of the surface of the substrate so as to polish the surface of the substrate.

[0005] The ~~invention~~ disclosure also provides a chemical-mechanical polishing composition comprising (a) wet-process silica, (b) an oxidizing agent that oxidizes nickel-phosphorous, (c) a chelating agent, (d) polyvinyl alcohol, wherein the polyvinyl alcohol has a molecular weight of 8,000 g/mol to 50,000 g/mol, (c) water, wherein the polishing composition has a pH of 1 to 4, and wherein the polishing composition does not comprise a heterocyclic compound.

DETAILED DESCRIPTION OF THE INVENTION

[0006] The invention provides a chemical-mechanical polishing composition comprising, consisting essentially of, or consisting of (a) wet-process silica, (b) an oxidizing agent that oxidizes nickel-phosphorous, (c) a chelating agent, (d) polyvinyl alcohol, wherein the polyvinyl alcohol has a molecular weight of 8,000 g/mol to 50,000 g/mol, (c) water, wherein the polishing composition has a pH of 1 to 4.

[0007] The polishing composition comprises wet-process silica particles (e.g., condensation-polymerized or precipitated silica particles). Preferably, the wet-process silica particles are condensation-polymerized silica particles. Condensation-polymerized silica particles typically are prepared by condensing $Si(OH)_4$ to form colloidal particles, where colloidal is defined as having an average particle size between 1 nm and 1000 nm. Such abrasive particles can be prepared in accordance with U.S. Patent 5,230,833 or can be obtained as any of various commercially available products, such as the Akzo-Nobel Bindzil 50/80 product and the Nalco 1050, 1060, 2327, and 2329 products, as well as other similar products available from DuPont, Bayer, Applied Research, Nissan Chemical, Fuso, and Clariant. Other examples of suitable wet-process silica include but are not limited to XP320, XP442, CC-

CLAIMS

The invention claimed is:

1. A method of chemically-mechanically polishing a memory or rigid disk substrate, which method comprises:

(i) providing a memory or rigid disk substrate comprising at least one layer of nickel-phosphorous,

(ii) providing a polishing pad,

(iii) providing a polishing composition comprising:

(a) wet-process silica,

(b) an oxidizing agent that oxidizes nickel-phosphorous,

(c) a chelating agent,

(d) polyvinyl alcohol, wherein the polyvinyl alcohol has a degree of hydrolysis of about 90% or more,

(e) water,

wherein the polishing composition has a pH of about 1 to about 4,

(iv) contacting a surface of the substrate with the polishing pad and the polishing composition, and

(v) abrading at least a portion of the surface of the substrate to remove at least some nickel-phosphorous from the surface of the substrate and to polish the surface of the substrate.

2. The method of claim 1, wherein the polishing composition comprises about 1 wt. % to about 10 wt. % of wet-process silica.

3. The method of claim 1, wherein the oxidizing agent is hydrogen peroxide.

4. The method of claim 1, wherein the chelating agent is glycine or alanine.

5. The method of claim 1, wherein the polishing composition comprises about 0.1 wt. % to about 2 wt. % of the chelating agent.

6. The method of claim 1, wherein the polyvinyl alcohol has a degree of hydrolysis of about 98% or more.

7. The method of claim 1, wherein the polishing composition comprises about 0.1 wt. % to about 2 wt. % of polyvinyl alcohol.

8. The method of claim 1, wherein the polishing composition has a pH of about 1 to about 3.

9. The method of claim 1, wherein the substrate is a nickel-phosphorous-coated aluminum disk.

10. The method of claim 1, wherein the wet-process silica has an average particle size of about 10 nm to about 80 nm.

11. The method of claim 10, wherein the wet-process silica has an average particle size of about 10 nm to about 30 nm.

12. The method of claim 1, wherein the polyvinyl alcohol has a molecular weight of about 8,000 g/mol to about 50,000 g/mol.

13. The method of claim 12, wherein the polyvinyl alcohol has a molecular weight of about 13,000 g/mol to about 23,000 g/mol.

14. A method of chemically-mechanically polishing a memory or rigid disk substrate, which method comprises:

(i) providing a memory or rigid disk substrate,

(ii) providing a polishing pad,

(iii) providing the polishing composition comprising:

(a) wet-process silica,

(b) an oxidizing agent that oxidizes nickel-phosphorous,

(c) a chelating agent,

(d) polyvinyl alcohol, wherein the polyvinyl alcohol has a molecular weight of about 8,000 g/mol to about 50,000 g/mol,

(e) water,

wherein the polishing composition has a pH of about 1 to about 4, and wherein the polishing composition does not comprise a heterocyclic compound,

(iv) contacting a surface of the substrate with the polishing pad and the polishing composition, and

(v) abrading at least a portion of the surface of the substrate to remove at least some portion of the surface of the substrate so as to polish the surface of the substrate.

CLAIMS

1. A method of chemically-mechanically polishing a substrate, which method comprises:

(i) providing a substrate comprising at least one layer of nickel-phosphorous,

(ii) providing a polishing pad,

(iii) providing a polishing composition comprising:

(a) wet-process silica,

(b) an oxidizing agent that oxidizes nickel-phosphorous,

(c) a chelating agent,

(d) polyvinyl alcohol,

(e) water,

wherein the polishing composition has a pH of 1 to 4,

(iv) contacting a surface of the substrate with the polishing pad and the polishing composition, and

(v) abrading at least a portion of the surface of the substrate to remove at least some nickel-phosphorous from the surface of the substrate and to polish the surface of the substrate.

2. The method of claim 1, wherein the wet-process silica comprises two or more different types of silica particles.

3. The method of claim 1, wherein the wet-process silica has an average particle size of 10 nm to 80 nm.

4. The method of claim 3, wherein the wet-process silica has an average particle size of 10 nm to 30 nm.

5. The method of claim 1, wherein the polishing composition comprises 1 wt.% to 10 wt.% of wet-process silica.

6. The method of claim 1, wherein the oxidizing agent is hydrogen peroxide.

7. The method of claim 1, wherein the chelating agent is glycine or alanine.

8. The method of claim 1, wherein the polishing composition comprises 0.1 wt.% to 2 wt.% of the chelating agent.

9. The method of claim 1, wherein the polyvinyl alcohol has a molecular weight of 8,000 g/mol to 50,000 g/mol.

10. The method of claim 9, wherein the polyvinyl alcohol has a molecular weight of 13,000 g/mol to 23,000 g/mol.

11. The method of claim 1, wherein the polyvinyl alcohol has a degree of hydrolysis of 90% or more.

12. The method of claim 1, wherein the polishing composition comprises 0.1 wt.% to 2 wt.% of polyvinyl alcohol.

13. The method of claim 1, wherein the polishing composition has a pH of 1 to 3.

14. The method of claim 1, wherein the substrate is a nickel-phosphorous-coated aluminum disk.

15. A chemical-mechanical polishing composition comprising:

(a) wet-process silica,

(b) an oxidizing agent that oxidizes nickel-phosphorous,

(c) a chelating agent,

(d) polyvinyl alcohol, wherein the polyvinyl alcohol has a molecular weight of 8,000 g/mol to 50,000 g/mol,

(e) water,

wherein the polishing composition has a pH of 1 to 4, and wherein the polishing composition does not comprise a heterocyclic compound.

16. The composition of claim 15, wherein the wet-process silica comprises two or more different types of silica particles.

17. The composition of claim 15, wherein the wet-process silica has an average particle size of 10 nm to 80 nm.

18. The composition of claim 17, wherein the wet-process silica has an average particle size of 10 nm to 30 nm.

19. The composition of claim 15, wherein the polishing composition comprises 1 wt.% to 10 wt.% of wet-process silica.

20. The composition of claim 15, wherein the oxidizing agent is hydrogen peroxide.

21. The composition of claim 15, wherein the chelating agent is glycine or alanine.

22. The composition of claim 15, wherein the polishing composition comprises 0.1 wt.% to 2 wt.% of the chelating agent.

23. The composition of claim 15, wherein the polyvinyl alcohol has a molecular weight of 13,000 g/mol to 23,000 g/mol.

24. The composition of claim 15, wherein the polyvinyl alcohol has a degree of hydrolysis of 90% or more.

25. The composition of claim 15, wherein the polishing composition comprises 0.1 wt.% to 2 wt.% of polyvinyl alcohol.

26. The composition of claim 15, wherein the polishing composition has a pH of 1 to 3.

27. A method of chemically-mechanically polishing a substrate, which method comprises:

(i) providing a substrate,

(ii) providing a polishing pad,

(iii) providing the polishing composition of claim 15,

(iv) contacting a surface of the substrate with the polishing pad and the polishing composition, and

(v) abrading at least a portion of the surface of the substrate to remove at least some portion of the surface of the substrate so as to polish the surface of the substrate.