CLAIMS:

1. A functionally graded polishing pad for a CMP process comprising a polishing pad having a polishing surface for polishing a silicon-containing wafer and configured for use in a CMP procedure, wherein the polishing surface is one piece, substantially flat, and comprises at least two different areas having differing physical characteristics, and wherein the different areas comprise two or more different molecular weight polyurethanes.

2. The functionally graded polishing pad of claim 1 wherein the polishing pad further comprises polyurea.

3. The functionally graded polishing pad of claim 1 or claim 2 wherein the polishing pad further comprises a chain extender.

4. The functionally graded polishing pad of claim 3 comprising poly(urethane-urea) that is made by a process wherein the isocyanate is reacted with long chain diol and diamine to form a prepolymer that is subsequently reacted with diamine/diol curatives or chain extender to form the poly(urethane-urea).

5. The functionally graded polishing pad of any of claims 1-4 wherein at least one of the at least two areas comprises a block copolymer comprising said polyurethane.

6. The functionally graded polishing pad of claim 5 wherein the at least two areas each comprise a compositionally different polymeric material.

7. The functionally graded polishing pad of claim 6 wherein the at least two areas each comprise a different polymeric material having different physical parameters and wherein a region between the areas comprises mixtures of the compositionally different polymeric materials.

8. The functionally graded polishing pad of any of claims 5-7 wherein at least one of the at least two areas is annular.

9. The functionally graded polishing pad of any of claims 5-8 wherein the at least two areas each comprise a different polymeric material having different physical parameters and wherein the change in composition between the at least two areas is a step change.

10. The functionally graded polishing pad of any of claims 5-8 wherein the at least two areas each comprise a different polymeric material having different physical parameters and wherein the change in composition between the at least two areas is a continuous change.

11. The functionally graded polishing pad of any of claims 1-10 wherein the at least two areas each comprise a different polymeric material having different physical parameters and wherein the pad is circular with an edge and a center and the edge comprises one area and the center comprises another area and wherein the change in composition between the edge and the center is a continuous change.

12. The functionally graded polishing pad of any claim above produced by the process of sequential injection molding of at least two polymeric compositions to form said at least two areas.

13. The functionally graded polishing pad of any of claims 1-11 produced by the process of simultaneous injection molding of at least two polymeric compositions to form said at least two areas.

14. The functionally graded polishing pad of any claim above wherein at least one of the at least two polymeric compositions comprises a block copolymer having differing constituent polymeric composition in the block copolymer over distance.

15. The functionally graded polishing pad of any claim above wherein the graded pad has hardness gradations.

16. The functionally graded polishing pad of claim 15 where in the hardness gradations result from varying the concentration of molecular units of a block copolymer over distance.

17. A method of making a functionally graded polishing pad for a CMP process having a one-piece polishing surface comprising forming the pad by injecting two or more polymeric materials into a mold at different times.

18. The method of claim 17 wherein at least one of the polymeric materials is formed by first reacting an isocyanate with a long chain diol to form a high molecular weight isocyanate

prepolymer, and reacting the isocyanate prepolymer with diol curative or chain extender to form a polymer suitable for CMP.

19. The method of claim 17 wherein at least one of the polymeric materials is formed by first reacting an isocyanate with long chain diamine and diol to form a high molecular weight isocyanate prepolymer, and reacting with diamine and/or diol curatives or chain extenders to form a polymer suitable for CMP.

20. The method of claim 18 or claim 19 wherein the isocyanate comprises a block copolymer.

21. The method of claim 20 wherein the block copolymer has different constituent polymeric composition over distance.

22. The method of claim 20 wherein the concentration of the molecular units of the block copolymer of the pad varies over distance.

23. The method of claim 22 wherein the variation in concentration of the molecular units of the block copolymer over distance provides hardness gradations in the pad.

Claims

1. A polishing pad for polishing a substrate, the polishing pad comprising:

a polishing body having a polishing surface and comprising a polymer matrix, the polishing body comprising:

a first region of the polymer matrix including a first region of the polishing surface, the first region having a first hardness and a first porosity; and

a second region of the polymer matrix including a second region of the polishing surface, the second region having a second hardness and a second porosity, wherein the second hardness is different than the first hardness and the second porosity is different than the first porosity.

2. The polishing pad of claim 1, wherein the first porosity differs in pore size from the second porosity.

3. The polishing pad of claim 1, wherein the first porosity differs in pore density from the second porosity.

4. The polishing pad of claim 1, wherein the first porosity differs in pore size and in pore density from the second porosity.

5. The polishing pad of claim 1, wherein the first and second region form a grading.

6. The polishing pad of claim 5, wherein the grading is an annular grading.

7. The polishing pad of claim 5, wherein the grading is an island grading.

8. The polishing pad of claim 5, wherein the grading is a step grading.

9. The polishing pad of claim 1, wherein the polymer matrix comprises polyurethane.

10. The polishing pad of claim 1, wherein the polymer matrix comprises polyurea.