CLAIMS

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

a polishing body having a polishing side opposite a back surface; and

a polishing surface comprising a plurality of protrusions continuous with the polishing side of the polishing body, each protrusion comprising a flat surface distal from the polishing body and sidewalls tapered outwardly from the flat surface toward the polishing body, wherein the plurality of protrusions is arranged in a hexagonal-packed pattern; and

a button region disposed centrally within the hexagonal-packed pattern of the plurality of protrusions, the button region having a hexagonal shape.

2. The polishing pad of claim 1, wherein the sidewalls of each protrusion are planar.

3. The polishing pad of claim 2, wherein the sidewalls are tapered with an angle of less than approximately 30 degrees to normal of the polishing surface of the polishing body.

4. The polishing pad of claim 3, wherein the sidewalls are tapered with an angle approximately in the range of 0.1 – 10 degrees to normal of the polishing surface of the polishing body.

5. The polishing pad of claim 1, wherein the sidewalls of each protrusion are curved.

6. The polishing pad of claim 1, wherein the sidewalls of each protrusion are stepped.

7. The polishing pad of claim 1, wherein the flat surface of each of the plurality of protrusions has a shape that is selected from the group consisting of a circle, an oval, and a polygon.

8. The polishing pad of claim 1, wherein the hexagonal-packed pattern of the plurality of protrusions terminates proximate to a ring in a staggered arrangement, wherein the ring encompasses the plurality of protrusions at an outer most edge of the polishing side of the polishing body.

9. The polishing pad of claim 1, wherein the button region further comprises a triangular clocking mark on one side of the hexagonal shape.

10. The polishing pad of claim 1, wherein the plurality of protrusions is arranged in a plurality of high density regions having less spacing between adjacent protrusions within a high density region than between adjacent protrusions of adjacent high density regions.

11. The polishing pad of claim 10, wherein the protrusions of each high density region are arranged in a hexagonal-packed pattern.

12. The polishing pad of claim 11, wherein each of the high density regions is substantially square or rectangular, and spacing between each of the high density regions of the plurality of high density regions is based on an X-Y grid pattern.

13. The polishing pad of claim 11, wherein each of the high density regions has a shape selected from the group consisting of triangular, rhombic, and strip-based.

14. The polishing pad of claim 13, wherein the each of the high density regions has a rhombic shape, and a sub-pattern of a plurality of the high density regions is repeated every 60 degree rotation of the polishing pad.

15. The polishing pad of claim 1, wherein each of the plurality of protrusions has a maximum lateral dimension approximately in the range of 1 – 30 millimeters proximate to the polishing body, with a spacing between one another approximately in the range of 0.1 – 3 millimeters proximate to the polishing body.

16. The polishing pad of claim 1, wherein each protrusion of a first portion of the plurality of protrusions has a first maximum lateral dimension proximate to the polishing body, and each protrusion of a second portion of the plurality of protrusions has a second, different, maximum lateral dimension proximate to the polishing body.

17. The polishing pad of claim 16, wherein a pattern of the plurality of protrusions comprises a protrusion having a maximum lateral dimension of approximately 10 millimeters proximate to the polishing body surrounded by a plurality of protrusions each having a maximum lateral dimension of approximately 1 millimeter proximate to the polishing body.

18. The polishing pad of claim 1, wherein the flat surface of each protrusion of a first portion of the plurality of protrusions has a first shape, and the flat surface of each protrusion of a second portion of the plurality of protrusions has a second, different, shape.

19. The polishing pad of claim 1, wherein the total surface area of the plurality of protrusions is a portion approximately in the range of 40-80% of the total surface area of the polishing side of the polishing body.

20. The polishing pad of claim 1, wherein the height of each of the plurality of protrusions is approximately in the range of 0.5 – 1 millimeter.

21. The polishing pad of claim 1, wherein the plurality of protrusions comprises approximately between 50,000 – 200,000 protrusions for a polishing pad having a diameter approximately in the range of 74 – 81 cm (29 – 32 inches).

22. The polishing pad of claim 1, wherein each protrusion of a first portion of the plurality of protrusions has a first height from the polishing body, and each protrusion of a second portion of the plurality of protrusions has a second, different, height from the polishing body, but all of the plurality of protrusions are substantially co-planar distal from the polishing body.

23. The polishing pad of claim 1, wherein the polishing body and polishing surface are together homogeneous and unitary.

24. The polishing pad of claim 23, wherein the polishing body and polishing surface comprise a molded polyurethane material.

25. The polishing pad of claim 24, wherein the molded polyurethane material has a pore density of closed cell pores approximately in the range of 6% - 50% total void volume.

26. The polishing pad of claim 1, further comprising:
a foundation layer disposed on the back surface of the polishing body.

27. The polishing pad of claim 1, further comprising:
a detection region disposed in the back surface of the polishing body.

28. The polishing pad of claim 1, further comprising:
an aperture disposed in the polishing surface and polishing body; and
an adhesive sheet disposed on the back surface of the polishing body, the adhesive sheet providing an impermeable seal for the aperture at the back surface of the polishing body.

29. The polishing pad of claim 1, further comprising:
a sub pad disposed on the back surface of the polishing body.

30. The polishing pad of claim 1, further comprising:
a local area transparency (LAT) region disposed in the polishing body, the LAT region interrupting a pattern of the plurality of protrusions.

31. The polishing pad of claim 1, wherein, for each protrusion, a portion of each of the sidewalls undercuts the flat surface.

32. A polishing pad for polishing a substrate, the polishing pad comprising:
a polishing body having a polishing side opposite a back surface;
a polishing surface comprising a plurality of protrusions continuous with the polishing side of the polishing body, each protrusion comprising a flat surface distal from the polishing body and sidewalls tapered outwardly from the flat surface toward the polishing body, wherein the plurality of protrusions is arranged in a hexagonal-packed pattern; and

a solid button region disposed centrally within the hexagonal-packed pattern of the plurality of protrusions, with the solid button region having a hexagonal shape.

33. The polishing pad of claim 32, wherein the sidewalls of each protrusion are planar.

34. The polishing pad of claim 33, wherein the sidewalls are tapered with an angle of less than approximately 30 degrees to normal of the polishing surface of the polishing body.

35. The polishing pad of claim 34, wherein the sidewalls are tapered with an angle approximately in the range of 0.1 – 10 degrees to normal of the polishing surface of the polishing body.

36. The polishing pad of claim 32, wherein the flat surface of each of the plurality of protrusions has a shape that is selected from the group consisting of a circle, an oval, and a polygon.

37. The polishing pad of claim 32, wherein the hexagonal-packed pattern of the plurality of protrusions terminates proximate to a ring in a staggered arrangement, wherein the ring encompasses the plurality of protrusions at an outer most edge of the polishing side of the polishing body.