

CLAIMS

1. A retaining ring comprising:
 - an annular body including
 - a top surface configured to be secured to a carrier head;
 - a bottom surface configured to extend substantially parallel to a polishing surface;
 - an outer surface extending from the top surface at an outer top edge to the bottom surface at an outer bottom edge; and
 - an inner surface extending from an inner top edge at a corner with the top surface to an inner bottom edge at a corner with the bottom surface where the bottom surface is configured to extend substantially parallel to a polishing surface, wherein the inner surface comprises a plurality of regions positioned to contact and restrain an edge of a substrate during polishing, the plurality of regions spaced angularly around the annular body, the plurality of regions having different surface textures on the inner surface between the inner bottom edge and inner top edge, and at least the bottom surface and the plurality of regions of the inner surface positioned to contact and restrain the edge of the substrate are a plastic material.
2. The retaining ring of claim 1, wherein the plurality of regions are arranged in a regular pattern angularly around the retaining ring.
3. The retaining ring of claim 2, wherein the plurality of regions alternate between a first surface texture and a second surface texture.
4. The retaining ring of claim 2, wherein the plurality of regions are spaced at equal angular intervals around the retaining ring.
5. The retaining ring of claim 1, wherein the different surface textures comprise different roughnesses.

6. A retaining ring comprising:
 - an annular body including
 - a top surface configured to be secured to a carrier head;
 - a bottom surface configured to contact a polishing surface;
 - an outer surface extending from the top surface at an outer top perimeter to the bottom surface at an outer bottom perimeter; and
 - an inner surface extending from the top surface at an inner top perimeter to the bottom surface at an inner bottom perimeter, the inner surface comprising a plurality of regions spaced angularly around the annular body, the plurality of regions having different surface textures including a first roughness having an Ra between 4 and 64 microinches and a second roughness that is less than the first roughness.
7. The retaining ring of claim 1, wherein the different surface textures comprise surface grooving in different directions.
8. The retaining ring of claim 7, wherein the different directions include perpendicular directions.
9. The retaining ring of claim 7, wherein one of the different directions is parallel or perpendicular to the inner bottom perimeter.
10. The retaining ring of claim 1, wherein the different surface textures comprise surface grooving having different depths.
11. The retaining ring of claim 1, wherein the plurality of regions consist of seven to one-hundred and fifty regions.
12. A retaining ring comprising:
 - an annular body including
 - a top surface configured to be secured to a carrier head;
 - a bottom surface configured to contact a polishing surface;

an outer surface extending from the top surface at an outer top perimeter to the bottom surface at an outer bottom perimeter; and

an inner surface extending from the top surface at an inner top perimeter to the bottom surface at an inner bottom perimeter, the inner surface comprising a plurality of regions spaced angularly around the annular body, wherein the plurality of regions comprise at least first regions and second regions, wherein each of the first regions is tilted at a first tilt angle with respect to the bottom surface, wherein each of the second regions is tilted at a second tilt angle with respect to the bottom surface, and wherein the first tilt angle is different from the second tilt angle.

13. The retaining ring of claim 12, wherein the plurality of regions are arranged in a regular pattern.

14. The retaining ring of claim 13, wherein the first regions and the second regions alternate with each other around the annular body.

15. The retaining ring of claim 13, wherein the plurality of regions are spaced at equal angular intervals around the retaining ring.

16. The retaining ring of claim 12, wherein at least one of the first tilt angle or the second tilt angle is a right angle.

17. The retaining ring of claim 12, wherein the first regions are slanted inwardly from bottom to top and the second regions are slanted outwardly from bottom to top.

18. The retaining ring of claim 12, wherein the first tilt angle and the second tilt angle are up to 30° off vertical.