

Claims:

CLAIMS

1.- ____A substrate support, comprising:

a ceramic body comprising a substrate chucking surface;

an RF electrode disposed within the ceramic body;

a heating element embedded in the ceramic body, ~~the heating element configured to operating at temperatures above 600 degrees Celsius;~~

a plurality of substrate supporting features formed on the substrate chucking surface, ~~wherein—the number~~plurality of substrate supporting features ~~increases~~comprises:

a first group of supporting features radially from a center disposed in an inner region of the substrate chucking surface to an edge at a first radial distance, the first group of supporting features having a first constant density; and

a second group of supporting features radially disposed in an outer region of the substrate chucking surface; and at a second radial distance, the second group of supporting features having a second constant density, wherein the outer region surrounds the inner region, the second constant density is greater than the first constant density, and a ratio of the first radial distance to the second radial distance is between 1:1 and 4:1, and wherein a ratio of the second constant density to the first constant density is about 4:1 to about 10:1; and

a seasoning layer formed on the plurality of the substrate supporting features, the seasoning layer comprising ~~a~~ silicon nitride, silicon, or silicon oxide.

22. ____ The substrate support of claim 1, wherein a total number of the plurality of the substrate supporting features is about 1000 or greater.

3. ____ The substrate support of claim 1, wherein the plurality of the substrate supporting features are arranged in concentric circles.

4. The substrate support of claim 1, wherein the plurality of the substrate supporting features have an average surface roughness (Ra) of about 65 μm or less.

5. The substrate support of claim 1, wherein the Ra of the plurality of the substrate supporting features is about 15 μm to about 20 μm .

36. The substrate support of claim 1, wherein the seasoning layer has a hardness in a range of about 5 GPa to about 30 GPa.

47. The substrate support of claim 1, wherein the seasoning layer is silicon nitride.

8. The substrate support of claim 1, wherein the seasoning layer further comprises undoped silicon glass (USG).

59. The substrate support of claim 1, wherein the seasoning layer has a thickness of about 0.5 μm to about 1.2 μm .

610. A substrate support, comprising:

a body comprising a substrate chucking surface, the substrate chucking surface having an inner region and an outer region surrounding the inner region;

an electrode disposed within the body;

a ledge formed about a periphery of the body, the ledge surrounding the outer region; and

a plurality of substrate supporting features formed on the substrate chucking surface, the plurality of the substrate supporting features ~~having a first density in the inner region and a second density in the outer region, wherein a ratio of the first density to the second density is about 4:1 to about 10:1.~~comprises:

7. The substrate support of claim 6, wherein a first group of supporting features radially disposed in the inner region has of the substrate chucking surface

at a first radial distance, the first group of supporting features having a first constant density; and

a second group of supporting features radially disposed in the outer region has of the substrate chucking surface at a second radial distance, and the second group of supporting features having a second constant density, wherein a ratio of the second constant density to the first constant density is about 4:1 to about 10:1.

11. The substrate support of claim 10, wherein a ratio of the first radial distance to the second radial distance is about 2:1 to about 3:1.

812. The substrate support as in either of claim 4 or claim 610, wherein a total number of the plurality of the substrate supporting features is about 1000 or greater.

913. The substrate support as in either of claim 4 or claim 610, wherein the plurality of the substrate supporting features are arranged in concentric circles.

4014. The substrate support as in either of claim 4 or claim 610, wherein the plurality of the substrate supporting features have an average surface roughness (Ra) of about 15 μm to about 20 μm .

4415. The substrate support of claim 610, further comprising:

a seasoning layer formed on the plurality of substrate supporting features, wherein the seasoning layer comprises silicon, silicon nitride, silicon oxide, carbon doped silicon oxide (SiOC), silicon carbide (SiC), nitrogen containing silicon carbide (SiCN), aluminum oxide, aluminum nitride, undoped silicon glass (USG), boron-silicate glass (BSG), phosphorus-silicate glass (PSG), boron-phosphorus-silicate glass (BPSG), or any combination thereof, ~~wherein the seasoning layer is a bi-layer stack including silicon oxide and silicon nitride.~~

4216. The substrate support of claim 615, wherein the seasoning layer is a bi-layer stack including silicon oxide and silicon nitride.

17. The substrate support of claim 10, wherein each feature of the plurality of substrate supporting features has a diameter of about 1 mm to about 6 mm and a height of about 10 μm to about 50 μm .

4318. A substrate support, comprising:

a body comprising a substrate chucking surface;

an electrode disposed in the body;

a temperature control device disposed in the body;

an edge ring disposed about a periphery of the substrate chucking surface;

a plurality of substrate supporting features formed on the substrate chucking surface, wherein the substrate supporting features have a total number of about 1000 or greater, ~~and the number~~plurality of substrate supporting features ~~increases radially from a center of the substrate chucking surface to the edge ring; and~~comprises:

a first group of supporting features radially disposed in an inner region of the substrate chucking surface at a first radial distance, the first group of supporting features having a first constant density; and

a second group of supporting features radially disposed in an outer region of the substrate chucking surface at a second radial distance, the second group of supporting features having a second constant density, wherein the outer region surrounds the inner region, the second constant density is greater than the first constant density, and a ratio of the first radial distance to the second radial distance is between 1:1 and 4:1, and wherein a ratio of the second constant density to the first constant density is about 4:1 to about 10:1; and

a seasoning layer formed on the plurality of the substrate supporting features, the seasoning layer comprising a silicon oxide and silicon nitride.

4419. The substrate support of claim 4318, wherein each feature of the plurality of substrate supporting features has a diameter of about 1 mm to about 6 mm and a height of about 10 μm to about 50 μm .

4520. The substrate support of claim 4318, wherein the seasoning layer further comprises silicon, carbon doped silicon oxide (SiOC), silicon carbide (SiC), nitrogen

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containing silicon carbide (SiCN), aluminum oxide, aluminum nitride, undoped silicon glass (USG), boron-silicate glass (BSG), phosphorus-silicate glass (PSG), boron-phosphorus-silicate glass (BPSG), or any combination thereof.