CLAIMS

1. An electrostatic chuck for use in a substrate processing chamber, comprising a dielectric plate having an electrode disposed therein, the dielectric plate further including a central portion and a peripheral portion,

wherein the peripheral portion comprises an outer sidewall having at least one asperity,

wherein the at least one asperity is disposed between an upper surface and a lower surface of the dielectric plate;

wherein the at least one asperity extends radially outward from the outer sidewall; and

wherein at least one of:

the at least one asperity comprises a plurality of asperities extending radially outward along imaginary cylindrical surfaces of the outer sidewall, wherein the imaginary cylindrical surfaces are coaxial with and have different radii with respect to a central axis of the dielectric plate; or

the at least one asperity comprises a plurality of asperities arranged periodically; or

the at least one asperity comprises a plurality of asperities having hemispherical shapes, moth eye shapes, rectangular shapes, ellipsoid shapes, or truncated ellipse shapes; or

the at least one asperity comprises a plurality of asperities having a gap disposed between each of the plurality of asperities.

2. The electrostatic chuck of claim 1, wherein the at least one asperity has a concave shape or a convex shape.

3. The electrostatic chuck of claim 1, wherein at least one of:

the at least one asperity comprises a plurality of asperities extending radially outward along imaginary cylindrical surfaces of the outer sidewall, wherein the imaginary cylindrical surfaces are coaxial with and have different radii with respect to a central axis of the dielectric plate, or

the at least one asperity comprises a plurality of asperities arranged periodically.

4. The electrostatic chuck of claim 1, wherein the at least one asperity comprises a plurality of asperities having hemispherical shapes, moth eye shapes, rectangular shapes, ellipsoid shapes, or truncated ellipse shapes.

5. The electrostatic chuck of any of claims 1 to 4, wherein the at least one asperity comprises a plurality of asperities having a gap disposed between each of the plurality of asperities.

6. The electrostatic chuck of any of claims 1 to 5, wherein a width of the peripheral portion is 3 mm to 10 mm.

7. A substrate support for use in a substrate processing chamber, comprising:

a baseplate;

a dielectric plate having an electrode disposed therein,

wherein the dielectric plate is disposed on the baseplate and includes a central portion and a peripheral portion;

wherein the peripheral portion comprises an outer sidewall having at least one asperity;

wherein the at least one asperity is disposed between an upper surface and a lower surface of the dielectric plate;

wherein the at least one asperity extends radially outward from the outer sidewall; and

wherein at least one of:

the at least one asperity comprises a plurality of asperities extending radially outward along imaginary cylindrical surfaces of the outer sidewall, wherein the imaginary cylindrical surfaces are coaxial with and have different radii with respect to a central axis of the dielectric plate; or

the at least one asperity comprises a plurality of asperities arranged periodically; or

the at least one asperity comprises a plurality of asperities having hemispherical shapes, moth eye shapes, rectangular shapes, ellipsoid shapes, or truncated ellipse shapes; or

the at least one asperity comprises a plurality of asperities having a gap disposed between each of the plurality of asperities.

8. The substrate support of claim 7, further comprising a process kit, wherein the process kit is a quartz ring, a sapphire ring, or a composite ring comprising one or more of oxide, carbide, or metal materials.

9. The substrate support of claim 7, wherein the central portion is made of a same material as the peripheral portion.

10. The substrate support of claim 7, wherein a surface roughness of the outer sidewall is 0.2 to 100 microns.

11. The substrate support of claim 7, wherein an aspect ratio of the dielectric plate is 0.1 to 10.

12. A process chamber for processing a substrate, comprising:

a chamber body defining an inner volume therein;

the substrate support of any one of claims 7 to 11 disposed in the inner volume.