CLAIMS

1. A consumable part for a plasma processing chamber, comprising:

a plasma facing side of the consumable part;

an engineered surface formed into the plasma facing side of the consumable part; and

a plurality of raised features defining the engineered surface, wherein features of the plurality of raised features are arranged in a predefined pattern, wherein each of the plurality of raised features includes a top region having an outer edge and a sidewall;

a base surface of the engineered surface that surrounds each of the plurality of raised features, such that a corresponding sidewall of a corresponding raised feature extends up uniformly at an angle from the base surface to a corresponding top region, wherein the angle defined between a center axis of the corresponding raised feature and the corresponding sidewall is between 15 to 80 degrees; and

a conforming coating formed over the plurality of raised features,

wherein the consumable part is configured to be installed in the plasma processing chamber,

wherein the consumable part is configured to be exposed to a plasma and byproducts of the plasma.

2. The consumable part of claim 1, further comprising: a non-conforming coating formed over the conforming coating.

3. The consumable part of claim 1, wherein features in the plurality of raised features are macroscopic with heights of corresponding raised features with reference to the base surface ranging between 0.2 mm to 3 mm.

4. The consumable part of claim 1, further comprising:

an anodization layer formed over the engineered surface; and

a thermal spray coat formed over the anodization layer,

wherein the plurality of raised features is configured to enhance adhesion of the thermal spray coat to the anodization layer.

5. The consumable part of claim 1, wherein the consumable part comprises one of the following:

a liner configured to protect an inner wall of the plasma processing chamber; or

one or more portions of a C-shroud; or

one or more portions of a plasma confinement ring; or

a focus ring; or

an edge ring; or

an electrostatic semiconductor wafer clamping/chucking system; or

an upper electrode; or

a dielectric window for inductively coupled plasmas; or

a bottom electrode.

6. The consumable part of claim 1, further comprising:

a plurality of microscopic features indiscriminately applied to the plurality of raised features.

7. The consumable part of claim 1,

wherein the defined pattern includes a first zone and a second zone,

wherein the first zone includes a first set of raised features arranged in a first sub-pattern,

wherein the second zone includes a second set of raised features arranged in a second sub-pattern.

8. The consumable part of claim 1, wherein the plasma facing side of the consumable part is a conductive material or a dielectric material.

9. A method for building an engineered surface of a consumable part configured to be installed in a plasma processing chamber, comprising:

masking a plasma facing side of the consumable part using a stencil, wherein the stencil includes a pattern of openings providing access to the plasma facing side;

discriminately blasting the plasma facing side through the stencil with a blast media to create a plurality of raised features defining the engineered surface, the engineered surface being formed into the plasma facing side; and

forming a conforming coating over a plurality of raised features,

wherein features of the plurality of raised features are arranged in a predefined pattern over the engineered surface,

wherein each of the plurality of raised features includes a top region having an outer edge and a sidewall,

wherein a base surface of the engineered surface surrounds each of the plurality of raised features, such that a corresponding sidewall of a corresponding raised feature extends up at an angle from the base surface to a corresponding top region,

wherein the consumable part is configured to be exposed to a plasma and byproducts of the plasma.

10. The method of claim 9, further comprising: forming a non-conforming coating over the conforming coating.

11. The method of claim 9, wherein features in the plurality of raised features are macroscopic with heights of corresponding raised features with reference to the base surface ranging between 0.2 mm to 3 mm.

12. The method of claim 9, wherein the consumable part comprises one of the following:

a liner configured to protect an inner wall of the plasma processing chamber; or

one or more portions of a C-shroud; or

one or more portions of a plasma confinement ring; or

a focus ring; or

an edge ring; or

an electrostatic semiconductor wafer clamping/chucking system; or

an upper electrode; or

a dielectric window for inductively coupled plasmas; or

a bottom electrode.

13. The method of claim 9, wherein the discriminately blasting the plasma facing side through the stencil includes:

bead blasting the plasma facing side; or

grit blasting the plasma facing side,

wherein the blast media is made of the same type of material as the plasma facing side of the consumable part.

14. The method of claim 9,

wherein the stencil includes a first zone and a second zone,

wherein the first zone includes a first sub-pattern of openings, and

wherein the second zone includes a second sub-pattern of openings.

15. The method of claim 9, wherein the discriminately blasting the plasma facing side through the stencil includes:

blasting the plasma facing side through the stencil with the blast media at a first angle; and

blasting the plasma facing side through the stencil with the blast media at a second angle.

16. The method of claim 9, further comprising:

removing the stencil; and

indiscriminately blasting the plasma facing side with a second blast media to roughen the plurality of raised features with microscopic features.

17. The method of claim 9, further comprising:

anodizing the engineered surface to generate an anodization layer; and

applying a thermal spray coat to the anodization layer,

wherein at least some of the plurality of raised features are prominent through the anodization layer to enhance adhesion of the thermal spray coat to the anodization layer.

18. A plasma processing chamber for processing a wafer, comprising:

a bottom electrode configured to support the wafer;

a top electrode located over the bottom electrode; and

a consumable part including:

a plasma facing side of the consumable part;

an engineered surface formed into the plasma facing side of the consumable part;

a plurality of raised features defining the engineered surface, wherein features of the plurality of raised features are arranged in a predefined pattern, wherein each of the plurality of raised features includes a top region having an outer edge and a sidewall;

a base surface of the engineered surface that surrounds each of the plurality of raised features, such that a corresponding sidewall of a corresponding raised feature extends up uniformly at an angle from the base surface to a corresponding top region,

wherein the angle defined between a center axis of the corresponding raised feature and the corresponding sidewall is between 15 to 80 degrees; and

a conforming coating formed over the plurality of raised features,

wherein the consumable part is configured to be installed in the plasma processing chamber,

wherein the consumable part is configured to be exposed to a plasma and byproducts of the plasma.

19. The plasma processing chamber of claim 18, wherein the consumable part comprises one of the following:

a liner configured to protect an inner wall of the plasma processing chamber; or

one or more portions of a C-shroud; or

one or more portions of a plasma confinement ring; or

a focus ring; or

an edge ring; or

an electrostatic semiconductor wafer clamping/chucking system; or

an upper electrode; or

a dielectric window for inductively coupled plasmas; or

a bottom electrode.

20. The plasma processing chamber of claim 18, wherein features in the plurality of raised features are macroscopic with heights of corresponding raised features with reference to the base surface ranging between 0.2 mm to 3 mm,

a plurality of microscopic features indiscriminately applied to the plurality of raised features,

wherein the plasma facing side of the consumable part is a conductive material or a dielectric material.