

CLAIMS

- 5 1. A component of a semiconductor processing chamber, the component formed of a material comprising silicon and the component comprising a textured outer surface comprising a plurality of substantially uniform pyramidhillock-shaped structures, wherein the material is one of single crystal silicon, doped silicon, polysilicon, and multi-crystalline silicon.
- 10 2. The component as recited in Claim 1, wherein the component is at least one of an electrode, edge ring, and a liner.
- 15 ~~3. The component as recited in Claim 1, wherein the material is one of single crystal silicon, doped silicon, polysilicon, and multi-crystalline silicon.~~
4. ~~3.~~ The component as recited in Claim 1, wherein an average height of the plurality of pyramidhillock-shaped structures is in a range of about 500 nanometers to 20 microns.
- 20 ~~5. 4.~~ The component as recited in Claim 1, wherein the textured outer surface has a surface roughness in a range of about 0.2-2 microns.
- 25 ~~6. 5.~~ The component as recited in Claim 1, wherein an average reflectance of the plurality of pyramidhillock-shaped structures is in a range of about 5-30% between 400-800 nm of light.
- ~~7. 6.~~ The component as recited in Claim 1, wherein the plurality of pyramidhillock-shaped structures are inverted pyramidhillock-shaped structures.
- 30 ~~8. 7.~~ A component adapted for use in a semiconductor processing chamber, comprising a multi-crystalline silicon body including a textured surface having an surface area, wherein the textured surface comprises an area having a

plurality of bumps or pits, wherein the textured surface comprises a plurality of grain surfaces including a first grain surface and a second grain surface, wherein the first grain surface has a texture that is different from that of the second grain surface~~four-sided pyramid-shaped structures~~.

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~~9. The component as recited in claim 8, wherein the textured surface comprises a plurality of grain surfaces including a first grain surface and a second grain surface, wherein the first grain surface has a texture that is different from that of the second grain surface.~~

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~~10.8. _____~~ - The component as recited in claim ~~8~~7, wherein the multi-crystalline silicon body is a cast multi-crystalline silicon body.

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~~11.9. _____~~ The component as recited in claim ~~8~~7, wherein the multi-crystalline silicon body is a bulk multi-crystalline silicon body.

~~12.10. _____~~ The component as recited in Claim ~~8~~7, wherein the component is at least one of an electrode, edge ring, and a liner.

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~~13.11. _____~~ The component as recited in Claim ~~8~~7, wherein an average height of the plurality of ~~four-sided pyramid-shaped structures~~bumps or pits is in a range of about 500 nanometers to 20 microns.

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~~14.12. _____~~ The component as recited in Claim ~~8~~7, wherein the area having the plurality of ~~four-sided pyramid-shaped structures~~bumps or pits is formed over at least 90% of an entire surface area of the textured surface.

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~~15.13. _____~~ A method for texturing a silicon component of a semiconductor processing chamber, the method comprising:
providing the silicon component having an outer surface; and
texturing the outer surface to create a plurality of substantially uniform~~pyramid hillock~~-shaped structures on the outer surface, wherein the

	<u>silicon component is formed of one of single crystal silicon, doped silicon, polysilicon, and multi-crystalline silicon.</u>
5	~~16.~~ 14. The method as recited in Claim ~~15~~ 13, wherein the silicon component is selectively textured.
	~~17.~~ 15. The method as recited in Claim ~~15~~ 13, wherein texturing is achieved by chemically etching the outer surface.
10	~~18.~~ 16. The method as recited in claim ~~17~~ 15, wherein chemically etching is performed using a solution comprising potassium hydroxide.
	~~19.~~ 17. The method as recited in Claim ~~17~~ 15, wherein chemically etching is performed using a solution comprising sodium hydroxide.
15	~~20.~~ 18. The method as recited in Claim ~~17~~ 15, wherein chemically etching is performed using an acid mixture comprising nitric acid, acetic acid and hydrofluoric acid.
20	~~21. The method as recited in Claim 15, wherein the silicon component comprises one of single crystal silicon, doped silicon, polysilicon, and multi-crystalline silicon.~~
25	<u>19. The method as recited in Claim 18, wherein the acid mixture comprises nitric acid, hydrofluoric acid and acetic acid at a molar ratio of 4:1:6.</u>
	~~22.~~ 20. The method as recited in Claim ~~15~~ 13, wherein the plurality of ~~pyramid~~ <u>hillock</u> -shaped structures have a first average height in a range of about 500 nanometers to 20 microns.
30	~~23.~~ 21. The method as recited in Claim ~~22~~ 20, further comprising refurbishing the outer surface after the plurality of ~~pyramid~~ <u>hillock</u> -shaped structures have

eroded and have a second average height, wherein refurbishing comprises re-etching the outer surface to regenerate one or more of the plurality of ~~pyramid~~hillock-shaped structures to have a third average height, wherein the second average height is less than the first average height and the third average height.

~~24.~~22. The method as recited in Claim ~~15~~13, further comprising forming an oxide layer on the outer surface after texturing the outer surface.

~~25.~~23. The method as recited in Claim ~~15~~13, wherein texturing is achieved by patterning using soft or hard masks followed by etching the outer surface.

~~26.~~24. The method as recited in Claim ~~15~~13, wherein texturing creates a textured surface that can be used as a mask to generate further texturing.

~~27.~~25. The method as recited in Claim ~~15~~13, wherein the plurality of ~~pyramid~~hillock-shaped structures are inverted ~~pyramid~~hillock-shaped structures.

~~28.~~26. The method as recited in Claim ~~27~~25, wherein texturing is achieved by chemically etching the outer surface, wherein chemically etching is performed using a solution comprising $\text{Cu}(\text{NO}_3)_2/\text{HF}/\text{H}_2\text{O}_2/\text{H}_2\text{O}$.

~~29.~~27. A method for manufacturing a multi-crystalline silicon component for use in a semiconductor processing chamber, the method comprising:

providing a multi-crystalline silicon body having a surface; and
texturing the surface of the multi-crystalline silicon body to form a textured surface having a surface area, wherein the textured surface comprises an area having a plurality of ~~four-sided pyramid-shaped structures~~bumps or pits, wherein the plurality of ~~four-sided pyramid-shaped structures~~bumps or pits have a height of at least 500 nm.

- 30-28. The method, as recited in claim 2927, wherein texturing comprises anisotropically etching the surface.
- 5 31-29. The method, as recited in claim 2927, wherein anisotropically etching the surface comprises exposing the surface to a mixed acid.
- 32-30. The method, as recited in claim 2927, wherein providing the multi-crystalline silicon body comprises casting the multi-crystalline silicon body.
- 10 33-31. The method, as recited in claim 2927, wherein providing the multi-crystalline silicon body comprises polishing a used multi-crystalline silicon body.
- 15 34-32. The method, as recited in claim 2927, wherein texturing comprises exposing the surface to a mixture of nitric acid, hydrofluoric acid, and acetic acid.
- 20 35-33. The method, as recited in claim 3431, wherein the hydrofluoric acid has a molarity, and the acetic acid has a molarity, and wherein the molarity of the acetic acid is at least twice the molarity of the hydrofluoric acid.
- 25 36-34. The method, as recited in claim 3432, wherein the nitric acid has a molarity, and the acetic acid has a molarity, and wherein the molarity of the acetic acid is greater than the molarity of the nitric acid.
- 37-35. The method, as recited in claim 2927, wherein the area having the plurality of ~~four sided pyramid shaped structures~~ bumps or pits is formed over at least 90% of an entire area of the surface area.