Claims:

1. A substrate support assembly in a substrate process chamber, comprising:

a support member comprising a substrate support surface; and

a heating element comprising two or more heating element sections; wherein the heating element sections are connected together in one electrical loop, and wherein each heating element section responds independently and differently to an input power of a power source connected to the heating element.

2. The substrate support assembly of claim 1, wherein the heating element is provided to heat the substrate support surface in two or more heating zones, and each heating element section is independently configured to heat each heating zone on the substrate support surface of the support member.

3. The substrate support assembly of claim 1, wherein each heating element section responds to an input power frequency, and wherein the output temperature of the substrate support surface is determined by adjusting two or more input power frequencies of the power source.

4. The substrate support assembly of claim 1, wherein the output temperature in each heating element section is determined by an amplitude of an input power frequency of the power source, and wherein the output temperature of the substrate support surface is controlled by adjusting the amplitude of the power frequency.

5. The substrate support assembly of claim 1, wherein each heating element section comprises a resistive heating material selected form the group consisting of nickel, chromium, iron, aluminum, copper, molybdenum, platinum silicon carbide, their metal alloys, their nitride materials, their silicide materials, and combinations thereof.

6. The substrate support assembly of claim 1, wherein each heating element section comprises a resistive heating material in a shape selected form the group consisting of a wire, a foil or a ribbon.

7. The substrate support assembly of claim 1, wherein each resistive element section comprises a filler material in different sizes and shapes.

8. The substrate support assembly of claim 1, wherein the two or more resistive element sections are formed differently according to a variable in each heating element section, the variable being selected form the group consisting of the size, shape, pattern, distribution density of a resistive heating material, the size, shape, pattern, distribution density of a filler material, thereby effecting different output temperatures in the two or more resistive element sections when the power source connected to the heating element is on.

9. A substrate process chamber, comprising:

a substrate support assembly disposed inside the substrate process chamber; wherein the substrate support assembly comprising:

a support member comprising a substrate support surface; and

a heating element comprising two or more heating element sections, wherein the heating element sections are connected together in one electrical loop, and wherein each heating element section responds independently and differently to an input power of a power source connected to the heating element.

10. The substrate process chamber of claim 9, wherein the heating element is provided to heat the substrate support surface in two or more heating zones, and each heating element section of the heating element is independently configured to heat each heating zone on the substrate support surface of the support member.

11. The substrate process chamber of claim 9, wherein the substrate process chamber is selected from the group consisting of etch chambers,

cleaning chambers, CVD chambers, PVD chambers, ALD chambers, and combinations thereof.

12. The substrate process chamber of claim 9, wherein each heating element section responds to an input power frequency, and wherein the output temperature of the substrate support surface is determined by adjusting two or more input power frequencies of the power source.

13. The substrate process chamber of claim 9, wherein the output temperature in each heating element section is determined by an amplitude of an input power frequency of the power source, and wherein the output temperature of the substrate support surface is controlled by adjusting the amplitude of the power frequency.

14. The substrate process chamber of claim 9, wherein each heating element section comprises a filler material and a resistive heating material selected form the group consisting of nickel, chromium, iron, aluminum, copper, molybdenum, platinum silicon carbide, their metal alloys, their nitride materials, their silicide materials, and combinations thereof.

15. The substrate process chamber of claim 9, wherein each heating element section comprises a resistive heating material in a shape selected form the group consisting of a wire, a foil or a ribbon.

16. The substrate process chamber of claim 9, wherein the two or more resistive element sections are formed differently according to a variable in each heating element section, the variable being selected form the group consisting of the size, shape, pattern, distribution density of a resistive heating material, the size, shape, pattern, distribution density of a filler material, thereby effecting different output temperatures in the two or more resistive element sections when the power source connected to the heating element is on.

17. A method of heating a surface of a substrate in a process chamber, comprising:

heating a substrate support surface of a substrate support assembly having the substrate disposed thereon, wherein the substrate support assembly comprising a heating element comprising two or more heating element sections, wherein the heating element sections are connected together in one electrical loop, and wherein each heating element section responds differently to an input power of a power source connected to the heating element;

determining a responding power input resonant frequency in the two or more heating element sections of the heating element; and

applying the responding power input resonant frequency to the power source connected to the heating element.

18. The method of claim 17, further comprising:

adjusting the amplitude of each responding power input resonant frequency for each heating element section.

19. The method of claim 17, further comprising:

independently heating each heating element section of the heating element, wherein each heating element section correspond to each of two or more heating zones on the substrate support surface; and

providing a desired output temperature distribution across the two or more heating zones on the substrate support surface of the substrate support assembly

20. The method of claim 17, further comprising:

flowing a cooling medium circulated through a fluid channel embedded within the substrate support assembly; and

adjusting the output temperature of the substrate support surface of the substrate support assembly.

CLAIMS

1. A substrate support assembly for a substrate process chamber, comprising:

a support member comprising a substrate support surface; and

a heating element comprising two or more heating element sections; wherein the heating element sections are connected together in one electrical loop, and wherein each heating element section responds independently and differently to an input power of a power source connected to the heating element.

2. The substrate support assembly of claim 1, wherein the heating element is provided to heat the substrate support surface in two or more heating zones, and each heating element section is independently configured to heat each heating zone on the substrate support surface of the support member.

3. The substrate support assembly of claim 1, wherein each heating element section responds to an input power frequency, and wherein the output temperature of the substrate support surface is determined by adjusting two or more input power frequencies of the power source.

4. The substrate support assembly of claim 1, wherein the output temperature in each heating element section is determined by an amplitude of an input power frequency of the power source, and wherein the output temperature of the substrate support surface is controlled by adjusting the amplitude of the power frequency.

5. The substrate support assembly of claim 1, wherein each heating element section comprises a resistive heating material selected form the group consisting of nickel, chromium, iron, aluminum, copper, molybdenum, platinum silicon carbide, their metal alloys, their nitride materials, their silicide materials, and combinations thereof.

6. The substrate support assembly of claim 1, wherein each heating element section comprises a resistive heating material in a shape selected form the group consisting of a wire, a foil or a ribbon.

7. The substrate support assembly of claim 1, wherein each resistive element section comprises a filler material in different sizes and shapes.

8. The substrate support assembly of claim 1, wherein the two or more resistive element sections are formed differently according to a variable in each heating element section, the variable being selected form the group consisting of the size, shape, pattern, distribution density of a resistive heating material, the size, shape, pattern, distribution density of a filler material, thereby effecting different output temperatures in the two or more resistive element sections when the power source connected to the heating element is on.

9. A substrate process chamber, comprising:

a substrate support assembly disposed inside the substrate process chamber; wherein the substrate support assembly comprising:

a support member comprising a substrate support surface; and

a heating element comprising two or more heating element sections, wherein the heating element sections are connected together in one electrical loop, and wherein each heating element section responds independently and differently to an input power of a power source connected to the heating element.

10. The substrate process chamber of claim 9, wherein the heating element is provided to heat the substrate support surface in two or more heating zones, and each heating element section of the heating element is independently configured to heat each heating zone on the substrate support surface of the support member

11. The substrate process chamber of claim 9, wherein the substrate process chamber is selected from the group consisting of etch chambers,

cleaning chambers, CVD chambers, PVD chambers, ALD chambers, and combinations thereof.

12. The substrate process chamber of claim 9, wherein each heating element section responds to an input power frequency, and wherein the output temperature of the substrate support surface is determined by adjusting two or more input power frequencies of the power source.

13. The substrate process chamber of claim 9, wherein the output temperature in each heating element section is determined by an amplitude of an input power frequency of the power source, and wherein the output temperature of the substrate support surface is controlled by adjusting the amplitude of the power frequency.

14. The substrate process chamber of claim 9, wherein each heating element section comprises a filler material and a resistive heating material selected form the group consisting of nickel, chromium, iron, aluminum, copper, molybdenum, platinum silicon carbide, their metal alloys, their nitride materials, their silicide materials, and combinations thereof.

15. The substrate process chamber of claim 9, wherein each heating element section comprises a resistive heating material in a shape selected form the group consisting of a wire, a foil or a ribbon.

16. The substrate process chamber of claim 9, wherein the two or more resistive element sections are formed differently according to a variable in each heating element section, the variable being selected form the group consisting of the size, shape, pattern, distribution density of a resistive heating material, the size, shape, pattern, distribution density of a filler material, thereby effecting different output temperatures in the two or more resistive element sections when the power source connected to the heating element is on.

17. A method of heating a surface of a substrate in a process chamber, comprising:

heating a substrate support surface of a substrate support assembly having the substrate disposed thereon, wherein the substrate support assembly comprising a heating element comprising two or more heating element sections, wherein the heating element sections are connected together in one electrical loop, and wherein each heating element section responds differently to an input power of a power source connected to the heating element;

determining a responding power input resonant frequency in the two or more heating element sections of the heating element; and

applying the responding power input resonant frequency to the power source connected to the heating element.

18. The method of claim 17, further comprising:

adjusting the amplitude of each responding power input resonant frequency for each heating element section.

19. The method of claim 17, further comprising:

independently heating each heating element section of the heating element, wherein each heating element section correspond to each of two or more heating zones on the substrate support surface; and

providing a desired output temperature distribution across the two or more heating zones on the substrate support surface of the substrate support assembly

20. The method of claim 17, further comprising:

flowing a cooling medium circulated through a fluid channel embedded within the substrate support assembly; and adjusting the output temperature of the substrate support surface of the substrate support assembly.