

CLAIMS:

1. A method for auto-correction of at least one malfunctioning thermal control element among an array of thermal control elements that are independently controllable and located in a temperature control plate of a substrate support assembly which supports a semiconductor substrate during processing thereof, the method comprising:

detecting, by a control unit including a processor, that at least one thermal control element of the array of thermal control elements is malfunctioning;

deactivating, by the control unit, the at least one malfunctioning thermal control element; and

modifying, by the control unit, a power level of at least one functioning thermal control element in the temperature control plate to minimize impact of the malfunctioning thermal control element on the desired temperature output at the location of the at least one malfunctioning thermal control element,

wherein the at least one malfunctioning thermal control element is detected by performing electrical monitoring that senses an open circuit, a closed circuit, or an altered state of the at least one malfunctioning thermal control element.

2. A method of for auto-correction of at least one malfunctioning thermal control element among an array of thermal control elements that are independently controllable and located in a temperature control plate of a substrate support assembly which supports a semiconductor substrate during processing thereof, the method comprising:

detecting, by a control unit including a processor, that at least one thermal control element of the array of thermal control elements is malfunctioning;

deactivating, by the control unit, the at least one malfunctioning thermal control element; and

modifying, by the control unit, a power level of at least one functioning thermal control element in the temperature control plate to minimize impact of the malfunctioning thermal control element on the desired temperature output at the location of the at least one malfunctioning thermal control element,

wherein the array includes at least 50 thermal control elements and the temperature control plate is located between a temperature controlled base plate and a dielectric layer containing at least one electrostatic clamping electrode.

3. The method of claim 1, wherein the deactivating is performed by stopping supply of power to the at least one malfunctioning thermal control element.

4. The method of claim 1, wherein the at least one functioning thermal control element that is modified is a thermal control element that is adjacent to the at least one malfunctioning thermal control element.

5. The method of claim 1, wherein during the modifying, a matrix relating power input of a thermal control element to temperature output of the thermal control element is used.

6. The method of claim 5, wherein the matrix includes vectors.

7. The method of claim 1, further comprising:

calculating a power input of a thermal control element of the temperature control plate based on a desired temperature output and a matrix relating power input of the thermal control element to temperature output of the thermal control element.

8. The method of claim 1, wherein during the modifying, a unit response matrix is used.

9. A non-transitory computer readable storage medium, storing instructions, which when executed by a processor, performs a method of performing auto-correction for at least one malfunctioning thermal control element among an array of thermal control elements that are independently controllable and located in a temperature control plate of a substrate support assembly which supports a semiconductor substrate during processing thereof, the method comprising:

detecting that at least one thermal control element of the array of thermal control elements is malfunctioning;

deactivating the at least one malfunctioning thermal control element; and

modifying a power level of at least one functioning thermal control element in the temperature control plate to minimize impact of the malfunctioning thermal control element on the desired temperature output at the location of the at least one malfunctioning thermal control element,

wherein the at least one malfunctioning thermal control element is detected by performing electrical monitoring that senses an open circuit, a closed circuit, or an altered state of the at least one malfunctioning thermal control element.

10. A non-transitory computer readable storage medium, storing instructions, which when executed by a processor, performs a method of performing auto-correction for at least one malfunctioning thermal control element among an array of thermal control elements that are independently controllable and located in a temperature control plate of a substrate support assembly which supports a semiconductor substrate during processing thereof, the method comprising:

- detecting that at least one thermal control element of the array of thermal control elements is malfunctioning;

- deactivating the at least one malfunctioning thermal control element; and

- modifying a power level of at least one functioning thermal control element in the electrostatic chuck to minimize impact of the malfunctioning thermal control element on the desired temperature output at the location of the at least one malfunctioning thermal control element,

- wherein the array includes at least 50 thermal control elements and the temperature control plate is located between a temperature controlled base plate and a dielectric layer containing at least one electrostatic clamping electrode.

11. The non-transitory computer readable storage medium of claim 9, wherein the deactivating is performed by stopping supply of power to the at least one malfunctioning thermal control element.

12. The non-transitory computer readable storage medium of claim 9, wherein the at least one functioning thermal control element that is modified is a thermal control element that is adjacent to the at least one malfunctioning thermal control element.

13. The non-transitory computer readable storage medium of claim 9, wherein during the modifying, a matrix relating power input of a thermal control element to temperature output of the thermal control element is used.

14. The non-transitory computer readable storage medium of claim 13, wherein the matrix includes vectors.

15. The non-transitory computer readable storage medium of claim 9, the method further comprising:

calculating a power input of a thermal control element of the substrate support assembly based on a desired temperature output and a matrix relating power input of the thermal control element to temperature output of the thermal control element.

16. The non-transitory computer readable storage medium of claim 9, wherein during the modifying, a unit response matrix is used.

17. A method of processing a semiconductor substrate in a processing chamber on which a semiconductor substrate is supported on the substrate support assembly having the thermal control plate with the array of thermal control elements auto-corrected by the method recited in claim 1, the method comprising:

processing the semiconductor substrate while controlling a radial and azimuthal temperature profile across the semiconductor substrate.

18. The method of claim 17, wherein the processing comprises plasma etching.

19. The method of claim 17, wherein the processing comprises deposition processes.

20. The method of claim 17, wherein the processing comprises cleaning processes.

21. A method for auto-correction of at least one malfunctioning thermal control element among an array of thermal control elements that are independently controllable and located in a temperature control plate of a substrate support assembly which supports a semiconductor substrate during processing thereof, the method comprising:

detecting, by a control unit including a processor, that at least one thermal control element of the array of thermal control elements is malfunctioning;

deactivating, by the control unit, the at least one malfunctioning thermal control element; and

maintaining, by the control unit, power levels of all functioning thermal control elements in the temperature control plate to minimize impact of the malfunctioning thermal control element on the desired temperature output at the location of the at least one malfunctioning thermal control element,

wherein the at least one malfunctioning thermal control element is detected by performing electrical monitoring that senses an open circuit, a closed circuit, or an altered state of the at least one malfunctioning thermal control element.

22. The method of claim 1, wherein a notification indicating impact of the malfunctioning thermal control element on the substrate support assembly is transmitted to a device.