Claims:

1. An arrangement for detecting in-situ arcing events within a processing chamber of a plasma processing system during substrate processing, comprising:

a probe arrangement, wherein said probe arrangement is disposed on a surface of said processing chamber and is configured to measure at least one plasma processing parameter, wherein said probe arrangement includes

a plasma-facing sensor, and

a measuring capacitor, wherein said plasma-facing sensor is separate from the measuring capacitor and electrically connected ~~coupled~~ to a first plate of said measuring capacitor;

a detection arrangement, said detection arrangement is coupled to a second plate of said measuring capacitor, wherein said detection arrangement is configured for converting an induced current flowing through said measuring capacitor into a set of digital signals; and

a signal processor configured to process said set of digital signals to detect said in-situ arcing events.

2. The arrangement of claim 1 wherein said plasma-facing sensor is disposed in an upper electrode.

3. The arrangement of claim 1 wherein said plasma-facing sensor is disposed on a chamber wall of said processing chamber.

4. The arrangement of claim 1 wherein said plasma-facing sensor is made of a conductive material.

5. The arrangement of claim 1 wherein said plasma-facing sensor is a capacitively-coupled electrostatic (CCE) probe head.

6. The arrangement of claim 1 wherein said detection arrangement includes

a current-to-voltage converter, wherein said current-to-voltage converter is configured for at least converting said induced current flowing through said probe arrangement into a set of analog voltage signals; and

an analog-to-digital converter configured for at least converting said set of analog voltage signals into said set of digital signals,

wherein the signal processor is configured to process said set of digital signals to detect high frequency perturbations and detect said in-situ arcing events based on said high frequency perturbations.

7. The arrangement of claim 6 wherein said high frequency perturbations have amplitude excursions in both a positive direction and a negative direction.

8. The arrangement of claim 1 further including a tool control circuit, wherein said tool control circuit is configured for receiving a message from said detection arrangement when said in-situ arcing events are detected, said tool control circuit is configured to apply correction actions to fix said in-situ arcing events.

9. The arrangement of claim 1 further including a voltage measurement device coupled to said first plate of said measuring capacitor, wherein said voltage measurement device being configured for at least collecting voltage measurements and for measuring potential change of said plasma-facing sensor.

10. The arrangement of claim 9 wherein voltage measurements collected by said voltage measurement device is converted to a digital signal for signal processing to detect said in-situ arcing events.

11. A method for detecting in-situ arcing events within a processing chamber of a plasma processing system during substrate processing, comprising:

collecting a set of process data, said process data including induced current signals flowing through a measuring capacitor, the measuring capacitor separate from a plasma facing sensor and electrically connected to a plasma-facing sensor;

converting said induced current signals into a set of analog voltage signals;

converting said set of analog voltage signals into a set of digital signals;

analyzing said set of digital signals to detect high frequency perturbations; and

detecting said in-situ arcing events based on said high frequency perturbations.

12. The method of claim 11 further includes comparing a rate of change of said induced current signals to a pre-defined threshold, wherein said in-situ arcing events exist if said rate of change is outside of said pre-defined threshold.

13. The method of claim 12 further includes sending a message to a tool controller circuit when said in-situ arcing events are detected, said tool control circuit is configured to apply correction actions to fix said in-situ arcing events.

14. The method of claim 11 further includes measuring voltage signals from ~~a~~ the plasma-facing sensor to determine potential change during substrate processing.

15. The method of claim 14 further includes converting said voltage measurement data into digital signals.

16. The method of claim 15 further includes analyzing said digital signals to detect said high frequency perturbations, wherein said high frequency perturbations indicating said in-situ arcing events.

17. The method of claim 16 further includes comparing a rate of change of said voltage signals to a pre-defined threshold, wherein said in-situ arcing events exist if said rate of change is outside of said pre-defined threshold.

18. The method of claim 11 further includes applying a set of periodic radio frequency (RF) pulse trains to said measuring capacitor and measuring current decay signals of said measuring capacitor.

19. The method of claim 18 further includes applying an arc detection algorithm to detect said high frequency perturbations above said pre-determined threshold on said measuring capacitor's current decay signals.

20. The method of claim 19 further includes comparing a rate of change of said current decay signals to a pre-defined threshold, wherein said in-situ arcing events exist if said rate of change is outside of said pre-defined threshold.

21. A processing system for detecting in-situ arcing events during substrate processing, comprising:

at least a plasma processing chamber having a probe arrangement, wherein said probe arrangement is disposed on a surface of said processing chamber and is configured to measure at least one plasma processing parameter, wherein said probe arrangement includes

a plasma-facing sensor, and

a measuring capacitor, wherein said plasma-facing sensor is separate from the measuring capacitor and electrically connected ~~coupled~~ to a first plate of said measuring capacitor; and

a detection arrangement, said detection arrangement is coupled to a second plate of said measuring capacitor, wherein said detection arrangement is configured for converting an induced current flowing through said measuring capacitor into a set of digital signals, and wherein said detection arrangement is configured to process said set of digital signals to detect said in-situ arcing events.

22. The processing system of claim 21 wherein said plasma-facing sensor is disposed in an upper electrode.

23. The processing system of claim 21 wherein said plasma-facing sensor is disposed on a chamber wall of said processing chamber.

24. The processing system of claim 21 wherein said plasma-facing sensor is made of a conductive material.

25. The processing system of claim 21 wherein said plasma-facing sensor is a capacitively-coupled electrostatic (CCE) probe head.

26. The processing system of claim 21 wherein said detection arrangement includes:

a current-to-voltage converter, wherein said current-to-voltage converter is configured for at least converting said induced current flowing through said probe arrangement into a set of analog voltage signals;

an analog-to-digital converter configured for at least converting said set of analog voltage signals into said set of digital signals; and

a signal processor configured to process said set of digital signals to detect high frequency perturbations, wherein said in-situ arcing events are detected based on said high frequency perturbations.

27. The processing system of claim 26 wherein said high frequency perturbations have amplitude excursions in both a positive direction and a negative direction.

28. The processing system of claim 21 further including a tool control circuit, wherein said tool control circuit is configured for receiving a message from said detection arrangement when said in-situ arcing events are detected, said tool control circuit is configured to apply correction actions to fix said in-situ arcing events.

29. The processing system of claim 21 further including a voltage measurement device coupled to said first plate of said measuring capacitor, wherein said voltage measurement device being configured for at least collecting voltage measurements and for measuring potential change of said plasma-facing sensor.

30. The processing system of claim 29 wherein voltage measurements collected by said voltage measurement device is converted to a digital signal for signal processing to detect said in-situ arcing events.

31. A processing system for detecting in-situ arcing events within a processing chamber during substrate processing, comprising:

means for collecting a set of process data, said process data including induced current signals flowing through a measuring capacitor, the measuring capacitor separate from and electrically connected to a plasma-facing sensor;

means for converting said induced current signals into a set of analog voltage signals;

means for converting said set of analog voltage signals into a set of digital signals;

means for analyzing said set of digital signals to detect high frequency perturbations; and

means for detecting said in-situ arcing events based on said high frequency perturbations.

32. The processing system of claim 31 further includes means for comparing a rate of change of said induced current signals to a pre-defined threshold, wherein said in-situ arcing events exist if said rate of change is outside of said pre-defined threshold.

33. The processing system of claim 32 further includes means for sending a message to a tool controller circuit when said in-situ arcing events are detected, said tool control circuit is configured to apply correction actions to fix said in-situ arcing events.

34. The processing system of claim 31 further includes means for measuring voltage signals from ~~a~~ the plasma-facing sensor to determine potential change during substrate processing.

35. The processing system of claim 34 further includes converting said voltage measurement data into digital signals.

36. The processing system of claim 35 further includes analyzing said digital signals to detect said high frequency perturbations, wherein said high frequency perturbations indicating said in-situ arcing events.

37. The processing system of claim 36 further includes comparing a rate of change of said voltage signals to a pre-defined threshold, wherein said in-situ arcing events exist if said rate of change is outside of said pre-defined threshold.

38. The processing system of claim 31 further includes means for applying a set of periodic radio frequency (RF) pulse trains to said measuring capacitor and measuring current decay signals of said measuring capacitor.

39. The processing system of claim 38 further includes applying an arc detection algorithm to detect said high frequency perturbations above said pre-determined threshold on said measuring capacitor's current decay signals.

40. The processing system of claim 39 further includes comparing a rate of change of said current decay signals to a pre-defined threshold, wherein said in-situ arcing events exist if said rate of change is outside of said pre-defined threshold.