

Declaration for Translation of Korean Patent Registration No.

1016795280000

I, the undersigned _____ JiHoon Joseph Hong _____
residing at 702-1508, 516, Gaepo-ro, Gangnam-gu, Seoul, Republic of Korea
do solemnly and sincerely declare that I am well acquainted with the Korean
language and the English language and that the attached English translation of
Korean Patent Registration No. 1016795280000 (Korean Application No.
1020157022471) granted on 18 November 2016 is a true, correct and faithful
translation to the best of my knowledge and belief from the Korean language into the
English language.

Dated this day of June 16, 2017

A handwritten signature in black ink, appearing to read 'JiHoon', is written over a horizontal line.

Granted Claims in Korea

CLAIMS

What is claimed is:

1. A plasma processing system for processing at least a substrate with plasma, said plasma processing system comprising:
 - a first electrode, wherein said first electrode is a non-substrate bearing electrode;
 - a first ground plate configured to surround the first electrode, such that the first ground plate extends away from a center of the first electrode, and the first ground plate disposed at a physical separation from the first electrode;
 - a second electrode, said second electrode being different from said first electrode, said second electrode being configured for bearing said substrate, wherein the first electrode has a diameter that is smaller than a diameter of the second electrode;
 - a second ground plate configured to surround the second electrode, such that the second ground plate extends away from a center of the second electrode, the second ground plate disposed at a physical separation from the second electrode, the plasma during processing is defined between the first electrode and the second electrode and the center of the first electrode and the center of the second electrode are substantially aligned with one another, and wherein an interior diameter area of the first ground plate is disposed over the second electrode; and
 - a first signal source coupled with said first electrode and configured to provide a nonsinusoidal signal to only said first electrode for controlling ion energy distribution at said substrate when said substrate is processed on said second electrode in said plasma processing system, said non-sinusoidal signal being periodic;
 - wherein the second electrode, if coupled to another signal source, is configured to receive only a sinusoidal signal from the another signal source, and
 - wherein said first signal source is configured to provide a periodic signal to said first electrode for applying said non-sinusoidal signal to said substrate, said periodic signal provided from said first signal source, including at least a first set of

periodically ramped portions, each ramped portion of said first set of periodically ramped portions having a positive slope.

2. The plasma processing system of claim 1 further comprising:

a dielectric layer disposed between said first ground plate and at least a portion of said first electrode for electrically isolating said first electrode from said first ground plate.

3. The plasma processing system of claim 1 wherein said second electrode is disposed opposite to said first electrode such that said substrate is disposed between said second electrode and said first electrode.

4. The plasma processing system of claim 1 further comprising a second signal source coupled with said first electrode and configured to provide a sinusoidal signal to said first electrode for generating said plasma to process said substrate.

5. The plasma processing system of claim 1 further comprising a second signal source coupled with said second electrode and configured to provide a sinusoidal signal to said second electrode for generating said plasma to process said substrate.

6. (Canceled)

7. The plasma processing system of claim 1 wherein said periodic signal further includes at least periodic pulses.

8. The plasma processing system of claim 7 wherein said nonsinusoidal signal further includes at least constant negative portions between said periodic pulses for attracting positive ions in said plasma processing system.

9. The plasma processing system of claim 1, wherein when the DC blocking capacitor reduces parasitic and series capacitance, which increases efficiency in

controlling the ion energy distribution at said substrate, when present on the second electrode.

10. The plasma processing system of claim 9, wherein no electrode shield of said first electrode is required between the first electrode and the first ground plate.

11. A plasma processing system for processing a substrate with plasma, said plasma processing system comprising:

- a first electrode, wherein said first electrode is a non-substrate bearing electrode;

- a first ground plate configured to surround the first electrode, such that the first ground plate extends away from a center of the first electrode, and the first ground plate disposed at a physical separation from the first electrode;

- a second electrode, said second electrode being different from said first electrode, said second electrode being configured for bearing said substrate, wherein the first electrode has a diameter that is smaller than a diameter of the second electrode;

- a second ground plate configured to surround the second electrode, such that the second ground plate extends away from a center of the second electrode, the second ground plate disposed at a physical separation from the second electrode, the plasma during processing is defined between the first electrode and the second electrode and the center of the first electrode and the center of the second electrode are substantially aligned with one another, and wherein an interior diameter area of the first ground plate is disposed over the second electrode; and

- a first signal source coupled with said first electrode and configured to provide a non-sinusoidal signal to only said first electrode for controlling ion energy distribution at said substrate when said substrate is processed on said second electrode in said plasma processing system, said non-sinusoidal signal being periodic;

- wherein the second electrode is coupled to another signal source for providing a sinusoidal signal from the another signal source;

- wherein the first electrode having the diameter that is smaller than the diameter of the second electrode defines a first area ratio of an area of the first electrode

to an area of the second electrode is sized to a first duty cycle of a sinusoidal signal duty cycle supplied to the second electrode;

wherein a second area ratio of an area of the first electrode to an area of the second electrode is sized to second duty cycle of a sinusoidal signal duty cycle supplied to the second electrode, wherein the second area ratio is greater than the first area ratio for when the second duty cycle of the sinusoidal signal duty cycle supplied to the second electrode is greater than the first duty cycle; and

wherein said first signal source is configured to provide a periodic signal to said first electrode for applying said non-sinusoidal signal to said substrate, said periodic signal provided from said first signal source, including at least a first set of periodically ramped portions, each ramped portion of said first set of periodically ramped portions having a positive slope.

12. The plasma processing system of claim 11, further comprising,
a blocking capacitor, said blocking capacitor being a direct current (DC) blocking capacitor and is positioned between said first electrode and said first signal source, wherein said blocking capacitor is separate from said first electrode.

13. The plasma processing system of claim 11, wherein said periodic signal further includes at least periodic pulses.

14. The plasma processing system of claim 11, wherein said nonsinusoidal signal further includes at least constant negative portions between pulses of said periodic signal for attracting positive ions in said plasma processing system.

15. A plasma processing system for processing a substrate with plasma, said plasma processing system comprising:

a first electrode, wherein said first electrode is a non-substrate bearing electrode;

a first ground plate configured to surround the first electrode, such that the first ground plate extends away from a center of the first electrode, and the first ground plate

disposed at a physical separation from the first electrode;

a second electrode, said second electrode being different from said first electrode, said second electrode being configured for bearing said substrate, wherein the first electrode has a diameter that is smaller than a diameter of the second electrode;

a second ground plate configured to surround the second electrode, such that the second ground plate extends away from a center of the second electrode, the second ground plate disposed at a physical separation from the second electrode, the plasma during processing is defined between the first electrode and the second electrode and the center of the first electrode and the center of the second electrode are substantially aligned with one another, and wherein an interior diameter area of the first ground plate is disposed over the second electrode; and

a first signal source coupled with said first electrode and configured to provide a nonsinusoidal signal to only said first electrode for controlling ion energy distribution at said substrate when said substrate is processed on said second electrode in said plasma processing system, wherein said first signal source is configured to provide a periodic signal to said first electrode for applying said non-sinusoidal signal to said substrate, said periodic signal provided from said first signal source, including at least a first set of periodically ramped portions, each ramped portion of said first set of periodically ramped portions having a positive slope;

wherein the second electrode is coupled to another signal source for providing a sinusoidal signal from the another signal source;

wherein said nonsinusoidal signal further includes at least constant negative portions between pulses of said periodic signal for attracting positive ions in said plasma processing system.

16. A plasma processing system of claim 15, wherein when a sinusoidal signal having a first duty cycle is supplied to the second electrode, the first electrode having the diameter that is smaller than the diameter of the second electrode defines a first area ratio of an area of the first electrode to an area of the second electrode, and said first area ratio is sized to said first duty cycle of said sinusoidal signal supplied to the second electrode.

17. A plasma processing system of claim 16, wherein when a sinusoidal signal having a second duty cycle is supplied to the second electrode, a second area ratio of an area of the first electrode to an area of the second electrode is sized to said second duty cycle of said sinusoidal signal supplied to the second electrode, wherein the second area ratio is greater than the first area ratio for when the second duty cycle of the sinusoidal signal supplied to the second electrode is greater than the first duty cycle.

18. The plasma processing system of claim 15, further comprising,
a blocking capacitor, said blocking capacitor being a direct current (DC) blocking capacitor and is positioned between said first electrode and said first signal source, wherein said blocking capacitor is separate from said first electrode.

19. The plasma processing system of claim 15, wherein said periodic signal further includes at least periodic pulses.