

Claims

1. An arrangement for performing pressure control within a processing chamber of a plasma processing system during processing of a substrate, said processing chamber including a chamber wall, comprising:

5 a peripheral ring configured at least for surrounding a confined chamber volume, said peripheral ring including a peripheral ring vertical structure that is disposed inward of said chamber wall such that said confined chamber volume does not extend to said chamber wall, wherein said confined chamber volume is capable of sustaining a plasma for etching said substrate during substrate processing, said peripheral ring including a first plurality of slots,
10 wherein said first plurality of slots is configured at least for exhausting processed byproduct gas from said confined chamber volume during said substrate processing; and

a conductive control ring, wherein said conductive control ring is positioned next to said peripheral ring, wherein said peripheral ring is nested inside said conductive control ring such that said conductive control ring surrounds said peripheral ring, said conductive control ring
15 includes a second plurality of slots, wherein each of said peripheral ring and said conductive ring comprises an upper portion, a side portion, and a lower portion wherein at least one of the upper portion, the side portion, and the lower portion of said peripheral ring comprises a first slot of said first plurality of slots and said conductive control ring comprises a second slot of said second plurality of slots, wherein said pressure control is achieved by moving said conductive
20 control ring relative to said peripheral ring such that said first slot of said first plurality of slots of said peripheral ring and said second slot of said second plurality of slots of said conductive control ring are offset with respect to one another in a range of zero offset to full offset.

2. The arrangement of claim 1 further including a motor, wherein said motor is configured
25 to move said conductive control ring to perform said pressure control.

3. The arrangement of claim 2 further including a set of sensors having at least one sensor configured for collecting processing data about pressure volume within said confined chamber volume.

30 4. The arrangement of claim 3 further including a control module configured at least for receiving said processing data from said set of sensors, analyzing said processing data, determining a new position for said conductive control ring, and
35 sending said new position as part of a set of instructions to said motor.

5. The arrangement of claim 4 wherein said motor is configured to receive said set of instructions and to move said conductive control ring to adjust said pressure volume within said confined chamber volume.

5 6. The arrangement of claim 1 wherein said conductive control ring is made from a dielectric material.

7. The arrangement of claim 1 wherein said plasma processing system is a capacitively-coupled plasma processing system.

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8. A plasma confinement arrangement within a processing chamber of a plasma processing system during processing of a substrate, comprising:

a peripheral ring with a first set of slots, wherein said peripheral ring surrounds a confined chamber volume capable of sustaining a plasma during substrate processing, said peripheral ring including a peripheral ring horizontal structure that is disposed above a plane defined by said substrate, said first set of slots being configured for at least exhausting processed byproduct gas from said confined chamber volume during said substrate processing;

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a conductive control ring with a second set of slots, said conductive control ring includes a conductive control ring horizontal structure that is positioned next to said peripheral ring horizontal structure;

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wherein said peripheral ring is nested inside said conductive control ring such that said conductive control ring surrounds said peripheral ring;

wherein each of said peripheral ring and said conductive ring comprises an upper portion, a side portion, and a lower portion wherein at least one of the upper portion, the side portion, and the lower portion of said peripheral ring comprises a first slot of said first set of slots and said conductive control ring comprises a second slot of said second set of slots; and

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a motor configured at least for moving said control ring relative to said peripheral ring such that a first slot of said first set of slots of said peripheral ring and a second slot of said second set of slots of said control ring are offset with respect to one another in a range of zero offset to full offset.

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9. The plasma confinement arrangement of claim 8 further including a set of sensors having at least one sensor configured for collecting processing data within said confined chamber volume.

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10. The plasma confinement arrangement of claim 9 further including a control module configured for at least

receiving said processing data from said set of sensors,
analyzing said processing data,

determining a new position for said conductive control ring, and
sending said new position as part of a set of instructions to said motor.

11. The plasma confinement arrangement of claim 10 wherein said motor is configured to
5 receive said set of instructions and to adjust said conductive control ring to maintain plasma
confinement within said confined chamber volume.

12. The plasma confinement arrangement of claim 11 wherein said conductive control ring
is made from a dielectric material.

10 13. The plasma confinement arrangement of claim 12 wherein said plasma processing
system is a capacitively-coupled plasma processing system.

14. An arrangement for performing pressure control within a processing chamber of a
15 plasma processing system during processing of a substrate, said processing chamber including
a chamber wall, comprising:

a peripheral ring configured at least for surrounding a confined chamber volume, said
peripheral ring including a peripheral ring vertical structure that is disposed inward of said
chamber wall such that said confined chamber volume does not extend to said chamber wall,
20 wherein said confined chamber volume is capable of sustaining a plasma for etching said
substrate during substrate processing, said peripheral ring including a first plurality of slots,
wherein said first plurality of slots is configured at least for exhausting processed byproduct gas
from said confined chamber volume during said substrate processing; and

a conductive control ring, wherein said conductive control ring is positioned next to said
25 peripheral ring, said conductive control ring includes a conductive control ring vertical structure
that is positioned next to said peripheral ring vertical structure, said conductive control ring
includes a second plurality of slots, wherein said pressure control is achieved by moving said
conductive control ring relative to said peripheral ring such that a first slot of said first plurality of
slots of said peripheral ring and a second slot of said second plurality of slots of said conductive
30 control ring are offset with respect to one another in a range of zero offset to full offset; wherein
each of said peripheral ring and said conductive ring comprises a C-shaped exhaust plate
having an upper plate, a side plate, and a lower plate wherein the upper plate, the side plate
and the lower plate comprises a plurality of slots for exhausting processed byproduct gas from
said confined chamber and wherein said conductive exhaust ring surrounds said peripheral
35 exhaust ring.