

CLAIMS

1. A plasma processing system having at least a plasma processing chamber for processing a substrate using plasma, said substrate having at least a center region and a bevel edge region, comprising:
 - a lower electrode configured for supporting said substrate during said processing;
 - an upper electrode;
 - an upper plasma exclusion zone (PEZ) ring disposed outside of an outer periphery of said upper electrode;
 - a lower plasma exclusion zone (PEZ) ring disposed outside of an outer periphery of said lower electrode; and
 - control logic to operate said plasma processing system in at least a first processing state and a second processing state, said control logic causing said plasma to be present above said center region of said substrate during said first processing state to at least perform plasma processing of said center region during said first processing state, said control logic causing said plasma to be absent above said center region of said substrate but present adjacent to said bevel edge region during said second processing state to at least perform plasma processing of said bevel edge region during said second processing state, said control logic further causing said upper electrode to be in an RF floating state during said second processing state, wherein said substrate is disposed on a surface of said lower electrode during both said first processing state and said second processing state,
 - a first actuator interfaced with said control logic to move said upper electrode in a direction parallel to a chamber center axis of said plasma processing chamber to render a gap between a lower surface of said upper electrode and an upper surface of said substrate, when present, narrower in said second processing state relative to a gap between said lower surface of said upper electrode and said upper surface of said substrate, when present, that exists during said first processing state;
 - a second actuator interfaced with said control logic to move said upper PEZ ring vertically in the direction parallel to the chamber center axis;
 - a third actuator interfaced with said control logic to move said lower PEZ ring vertically in a direction parallel to the chamber center axis;
 - wherein for the first processing state the control logic causes the first actuator to move the upper electrode away from the lower electrode, the second actuator to move a lower

surface of the upper PEZ ring to be substantially coplanar to the lower surface of the upper electrode, and the third actuator to move an upper surface of the lower PEZ ring to be substantially coplanar to an upper surface of the lower electrode:

wherein for the second processing state the control logic causes the first actuator to move the upper electrode toward the lower electrode, the second actuator to move the lower surface of the upper PEZ ring to be away from the lower surface of the upper electrode, and the third actuator to move the upper surface of the lower PEZ ring to be away from the upper surface of the lower electrode;

an RF switch interfaced with said control logic, said control Magic is configured to cause the RF switch to set the upper electrode to other than said RF floating state during said first processing state and to said RF floating state during said second processing state.

2. The plasma processing system of claim 1 wherein the upper and lower PEZ rings move in a direction parallel to the chamber center axis of said chamber.
3. The plasma processing system of claim 1 wherein said upper electrode is in an RF powered state during said first processing state.
4. The plasma processing system of claim 1 wherein said gap between a lower surface of said upper electrode and said substrate is between about 1 cm and about 20 cm during said first processing state, said gap is below about 1 mm during said second processing state.
5. The plasma processing system of claim 1, wherein the first processing state and the second processing state operate in a same chamber that is the plasma processing chamber.
6. A plasma processing system, comprising: a chamber, including, a lower electrode configured for supporting a substrate during a processing; an upper electrode;
an upper plasma exclusion zone (PEZ) ring disposed outside of an outer periphery of said upper electrode;
a lower plasma exclusion zone (PEZ) ring disposed outside of an outer periphery of said lower electrode; and
control logic to operate said plasma processing system in a first processing state and a second processing state,

a first actuator interfaced with said control logic to move said upper electrode in a direction parallel to a center axis of said chamber to render a gap between a lower surface of said upper electrode and an upper surface of said substrate, when present, narrower in said second processing state relative to a gap between said lower surface of said upper electrode and said upper surface of said substrate, when present, that exists during said first processing state;

a second actuator interfaced with said control logic to move said upper PEZ ring vertically in the direction parallel to said center axis;

a third actuator interfaced with said control logic to move said lower PEZ ring vertically in a direction parallel to said center axis;

wherein for the first processing state the control logic causes the first actuator to move the upper electrode away from the lower electrode, the second actuator to move a lower surface of the upper PEZ ring to be substantially coplanar to the lower surface of the upper electrode, and the third actuator to move an upper surface of the lower PEZ ring to be substantially coplanar to an upper surface of the lower electrode;

wherein for the second processing state the control logic causes the first actuator to move the upper electrode toward the lower electrode, the second actuator to move the lower surface of the upper PEZ ring to be away from the lower surface of the upper electrode, and the third actuator to move the upper surface of the lower PEZ ring to be away from the upper surface of the lower electrode.

7. The plasma processing system of claim 6, further comprising,

an RF switch interfaced with said control logic, said control logic is configured to cause the RF switch to set the upper electrode to other than a RF floating state during said first processing state and to said RF floating state during said second processing state.

8. The plasma processing system of claim 6, wherein said control logic causing said plasma to be present above a center region of said substrate during said first processing state to at least perform plasma processing of said center region during said first processing state.

9. The plasma processing system of claim 6, wherein said control logic causing said plasma to be absent above a center region of said substrate but present adjacent to a bevel

edge region during said second processing state to at least perform plasma processing of said bevel edge region during said second processing state.

10. The plasma processing system of claim 6, wherein said control logic causing said upper electrode to be in an RF floating state during said second processing state, wherein said substrate is configured to be disposed on the upper surface of said lower electrode during both said first processing state and said second processing state.

11. The plasma processing system of claim 6,
wherein said gap between said lower surface of said upper electrode and said upper surface of said substrate during said first processing state is between about 1 cm and about 20 cm during said first processing state;

wherein said gap between said lower surface of said upper electrode and said upper surface of said substrate during said second processing state is below about 1 mm during said second processing state such that said plasma does not exist above a center region of said substrate, wherein said plasma exists in a bevel edge region during said second processing state.

12. The plasma processing system of claim 6, wherein said upper electrode is in an RF powered state during said first processing state.

13. The plasma processing system of claim 6, wherein the first processing state and the second processing state operate in a same chamber that is the plasma processing chamber.