Claims

1. A substrate processing apparatus, comprising:

   an inner chamber formed by an upper portion and a lower portion;

   a substrate support to support a substrate within the upper portion of the inner chamber;

   a plasma system to provide the inner chamber with plasma species from the top side of the inner chamber;

   an outer chamber surrounding the upper portion of the inner chamber whereas the lower portion of the inner chamber extends to the outside of the outer chamber and remains uncovered by the outer chamber; and

   a movable lid system,

   wherein the plasma system comprises:

   a plasma applicator in the movable lid system.

2. The apparatus of claim 1, comprising:

   a heater in the outer portion to heat the upper portion of the inner chamber.

3. The apparatus of claim 1 or 2, comprising:

   heat reflectors in the outer chamber.

4. The apparatus of any preceding claim, wherein the plasma system is configured to provide the inner chamber with two different plasma species entering the inner chamber via a top part of the upper portion of the inner chamber.

5. The apparatus of any preceding claim, comprising:

   a feedthrough of at least one in-feed line in the lid system.

6. The apparatus of any preceding claim, wherein the plasma system comprises a microwave plasma generator and/or a hollow cathode plasma generator.

7. The apparatus of any preceding claim, wherein the inner chamber comprises a reaction chamber bowl.

8. The apparatus of claim 7, wherein the substrate support resides symmetrically with respect to the reaction chamber bowl.

9. The apparatus of any preceding claim, comprising a flow guide part in between the plasma system and a reaction chamber bowl.

10. The apparatus of any preceding claim 7-9, the apparatus being configured to press the reaction chamber bowl against the flow guide part, a reaction chamber top part forming the top part of the upper portion of the inner chamber or a reaction chamber counterpart, optionally having a seal therebetween.

11. The apparatus of any preceding claim 10, wherein the seal is a vacuum seal.

12. The apparatus of any preceding claim 7-11, wherein the reaction chamber bowl is configured to be lowered by a bowl lift actuator for substrate loading.

13. The apparatus of any preceding claim, comprising a free lateral distance of at least 50 mm from the perimeter of the substrate support to a nearest surface of a surrounding reaction chamber bowl.

14. A substrate processing apparatus, comprising:

an inner chamber formed by an upper portion and a lower portion;

a substrate support to support a substrate within the upper portion of the inner chamber;

a plasma system to provide the inner chamber with plasma species from the top side of the inner chamber;

an outer chamber surrounding the upper portion of the inner chamber whereas the lower portion of the inner chamber extends to the outside of the outer chamber and remains uncovered by the outer chamber; and

a Peltier cooler attached to a chemical source container, where the Peltier cooler comprises a control arrangement configured to control the cooler with two fixed non-zero voltage levels.