CLAIMS

1. A cleaning assembly comprising:

a substrate, wherein one or more patterns are formed on a bottom side of the substrate, wherein one or more structures within the one or more patterns attract one or more particles from a conductive chuck via at least electrostatic attraction when the substrate is positioned on the conductive chuck;

one or more batteries; and

a conductor element attached to a top side of the substrate, wherein the one or more batteries are electrically coupled to the conductor element,

wherein the one or more batteries are configured to establish an electric field between the conductor element and the conductive chuck to enhance electrostatic-based uptake of charged particles from the conductive chuck.

2. The cleaning assembly of Claim 1, wherein the substrate comprises a ceramic wafer.

3. The cleaning assembly of Claim 1, wherein the substrate is shaped as a semiconductor wafer.

4. The cleaning assembly of Claim 1, wherein the one or more structures within the one or more patterns are formed with carbon nanotubes (CNTs).

5. The cleaning assembly of Claim 1, wherein the substrate is configured for manipulation via a handling device.

6. The cleaning assembly of Claim 1, wherein the substrate includes a plurality of pattern types, wherein each pattern type is configured for attracting particles of different size.

7. The cleaning assembly of Claim 1, wherein the electrostatic attraction is caused by Van der Waals forces.

8. The cleaning assembly of Claim 1, further comprising a ground connection, wherein the ground connection is configured to ground the conductive chuck.

9. The cleaning assembly of Claim 1, wherein the electric field is between 0.1 and 5 kV.

10. The cleaning assembly of Claim 1, wherein the substrate includes one or more reservoirs.

11. The cleaning assembly of Claim 10, wherein the one or more reservoirs are configured to carry one or more chemical reactants.

12. The cleaning assembly of Claim 11, wherein the substrate includes one or more valves for releasing the one or more chemical reactants from the one or more reservoirs onto the conductive chuck.

13. The cleaning assembly of Claim 12, wherein the one or more valves comprise one or more mechanical valves configured to open when the substrate is positioned on the conductive chuck.

14. The cleaning assembly of Claim 11, wherein the one or more reservoirs are configured to release the one or more chemical reactants upon exposure to a thermal impact.

15. The cleaning assembly of Claim 14, wherein the one or more reservoirs include one or more valves activatable by a shape memory alloy actuator, wherein the shape memory alloy actuator is configured to open the one or more valves based on a temperature change of the shape memory alloy actuator.

16. The cleaning assembly of Claim 1, wherein the substrate is mountable in a cleaning substrate cabinet, wherein the substrate is deliverable to a process chamber from the cleaning substrate cabinet via a handling device.

17. A system comprising:

a cleaning substrate cabinet, wherein the cleaning substrate cabinet is configured to store a cleaning substrate, wherein one or more patterns are formed on a bottom side of the cleaning substrate, wherein one or more structures within the one or more patterns attract one or more particles from a conductive chuck via at least electrostatic attraction or mechanical trapping when the cleaning substrate is positioned on the conductive chuck, wherein the cleaning substrate comprises one or more batteries; and a conductor element attached to a top side of the substrate, wherein the one or more batteries are electrically coupled to the conductor element, wherein the one or more batteries are configured to establish an electric field between the conductor element and the conductive chuck to enhance electrostatic-based uptake of charged particles from the conductive chuck.

18. A system comprising:

a process chamber, wherein the process chamber contains one or more wafer chucks; and

a handling device, wherein the handling device is configured to receive a cleaning substrate cabinet containing one or more cleaning substrates, wherein the handling device is further configured to translate the one or more cleaning substrates from the cleaning substrate cabinet to the one or more conductive chucks within the process chamber, wherein one or more patterns are formed on a bottom side of the one or more cleaning substrates, wherein one or more structures within the one or more patterns attract one or more particles from the one or more conductive chucks via at least electrostatic attraction when the one or more cleaning substrates are positioned on the one or more conductive chucks , wherein the cleaning substrate comprises one or more batteries; and

a conductor element attached to a top side of the substrate, wherein the one or more batteries are electrically coupled to the conductor element, wherein the one or more batteries are configured to establish an electric field between the conductor element and the conductive chuck to enhance electrostatic-based uptake of charged particles from the conductive chuck.