

CLAIMS

What is claimed:

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 chuck via at least one of electrostatic attraction or mechanical trapping when the substrate is positioned on the 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 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:
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.

9. The cleaning assembly of Claim 8, wherein the chuck is conductive and connected to ground.
10. The cleaning assembly of Claim 9, wherein the one or more batteries are configured to establish an electric field between 0.1 and 5 kV between the conductor element and the chuck to enhance electrostatic-based uptake of charged particles from the chuck.
11. The cleaning assembly of Claim 1, wherein the substrate includes one or more reservoirs.
12. The cleaning assembly of Claim 11, wherein the one or more reservoirs are configured to carry one or more chemical reactants.
13. The cleaning assembly of Claim 12, wherein the substrate includes one or more valves for releasing the one or more chemical reactants from the one or more reservoirs onto the chuck.
14. The cleaning assembly of Claim 13, wherein the one or more valves comprise one or more mechanical valves configured to open when the substrate is positioned on the chuck.
15. The cleaning assembly of Claim 12, wherein the one or more reservoirs are configured to release the one or more chemical reactors upon exposure to a thermal impact.
16. The cleaning assembly of Claim 15, 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.

17. 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.

18. 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 chuck via at least one of electrostatic attraction or mechanical trapping when the cleaning substrate is positioned on the chuck.

19. 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 wafer 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 wafer chucks via at least one of electrostatic attraction or mechanical trapping when the one or more cleaning substrates are positioned on the one or more wafer chucks.

20. A method comprising:
providing a cleaning substrate in a cleaning substrate cabinet;
moving the cleaning substrate from the cleaning substrate cabinet onto a wafer chuck contained within a process chamber via a handling device; and
cleaning a surface of the wafer chuck with the 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 the chuck via at least one of electrostatic attraction or mechanical trapping when the cleaning substrate is positioned on the chuck.
21. A characterization system comprising:
one or more characterization sub-systems, wherein the one or more characterization sub-systems are configured to inspect a portion of a wafer arranged on a chuck of a process tool, wherein the one or more characterization sub-systems are further configured to generate characterization data based on the inspection of the portion of the wafer arranged on the chuck of the process tool; and
a controller including one or more processors configured to:
receive the characterization data from the one or more characterization sub-systems;
determine, based on the characterization data, one or more cleaning parameters; and
direct one or more robotic assemblies to position a cleaning substrate to the chuck of the process tool.
22. The characterization system of Claim 21, wherein the one or more characterization sub-systems comprise:
at least one of an inspection tool or a particle review tool.
23. The characterization system of Claim 22, wherein the particle review tool includes an electron-beam tool.

24. The characterization system of Claim 23, wherein the electron-beam tool is configured to generate particle review data.

25. The characterization system of Claim 21, wherein the one or more cleaning parameters comprise:

at least one of preparation of the cleaning substrate, commencement of a cleaning cycle, or orientation of the cleaning substrate.