CLAIMS

1. A cluster tool suitable for processing semiconductor substrates, comprising:

a first mainframe including a first transfer chamber;

one or more process chambers mounted to the first mainframe and configured to conduct a process operation at a first pressure that is less than 700 Torr;

a second mainframe including a second transfer chamber, the second mainframe coupled to the first mainframe;

a pressure stabilization chamber between the first transfer chamber and the second transfer chamber;

one or more epitaxial deposition chambers coupled to the second mainframe and configured to conduct an epitaxial deposition operation at a second pressure within a range of 700 Torr to 800 Torr; and

a controller comprising instructions that, when executed, cause a plurality of operations to be conducted, the plurality of operations comprising:

performing the process operation on a substrate at the first pressure in one of the one or more process chambers;

maintaining a pressure of the pressure stabilization chamber at the first pressure;

transferring the substrate from the process chamber to the pressure stabilization chamber through a first door of the pressure stabilization chamber;

closing the first door;

increasing the pressure of the pressure stabilization chamber to the second pressure;

opening a second door of the pressure stabilization chamber;

transferring the substrate from the pressure stabilization chamber to a selected epitaxial deposition chamber of the one or more epitaxial deposition chambers; and

conducting an epitaxial deposition operation on the substrate while maintaining the selected epitaxial deposition chamber at the second pressure.

2. The cluster tool of claim 1, wherein the one or more process chambers comprise one or more cleaning chambers, and the process operation is a cleaning operation.

3. The cluster tool of claim 1, wherein the one or more process chambers comprise one or more reduced pressure epitaxial deposition chambers, and the process operation is a reduced pressure epitaxial deposition operation.

4. The cluster tool of claim 1, wherein the first mainframe operates at the first pressure and the second mainframe operates at the second pressure.

5. The cluster tool of claim 4, wherein the pressure stabilization chamber comprises:

an internal volume;

a substrate support disposed in the internal volume;

a first gas source fluidly connected to the internal volume to supply a pressure stabilization gas to the internal volume; and

an exhaust pump fluidly connected to the internal volume to exhaust the pressure stabilization gas from the internal volume.

6. The cluster tool of claim 4, further comprising:

a factory interface; and

one or more load lock chambers disposed between the factory interface and the first mainframe.

7. A method of processing a substrate, comprising:

positioning the substrate in a factory interface of a cluster tool;

transferring the substrate from the factory interface to a first processing volume of a cleaning chamber;

conducting a cleaning operation on the substrate in the cleaning chamber while maintaining the first processing volume at a first pressure to remove a native oxide from the substrate, the first pressure less than 700 Torr;

maintaining a pressure of a pressure stabilization chamber at the first pressure;

transferring the substrate from the cleaning chamber to the pressure stabilization chamber through a first door of the pressure stabilization chamber;

closing the first door;

increasing the pressure of the pressure stabilization chamber to a second pressure within a range of 700 Torr to 800 Torr;

opening a second door of the pressure stabilization chamber;

transferring the substrate from the pressure stabilization chamber to a second processing volume of an epitaxial deposition chamber; and

conducting an epitaxial deposition operation on the substrate while maintaining the second processing volume at the second pressure,

wherein the cluster tool comprises:

a first mainframe including a first transfer chamber;

one or more process chambers mounted to the first mainframe, the one or more process chambers including the cleaning chamber;

a second mainframe including a second transfer chamber and the epitaxial deposition chamber, the second mainframe coupled to the first mainframe;

the pressure stabilization chamber; and

a controller.

8. The method of claim 7, wherein the first pressure is within a range of 30 Torr to 80 Torr.

9. The method of claim 8, wherein the epitaxial deposition operation is conducted on the substrate while maintaining the second processing volume at a temperature that is within a range of 400 degrees Celsius to 1,200 degrees Celsius.

10. The method of claim 7, wherein transferring the substrate from the cleaning chamber to the pressure stabilization chamber further comprises:

transferring the substrate via the first transfer chamber while maintaining a pressure of the first transfer chamber at the first pressure; and

maintaining the second door of the pressure stabilization chamber closed while moving the substrate into the pressure stabilization chamber.

11. The method of claim 10, wherein:

the closed second door of the pressure stabilization chamber isolates the pressure stabilization chamber from the second transfer chamber; and

transferring the substrate from the cleaning chamber to the pressure stabilization chamber further comprises maintaining a pressure of the second transfer chamber at the second pressure.

12. The method of claim 11, wherein the first door is maintained closed while opening the second door.

13. The method of claim 12, wherein transferring the substrate from the pressure stabilization chamber to the second processing volume of the epitaxial deposition chamber further comprises transferring the substrate via the second transfer chamber.

14. A method of processing a substrate, comprising:

positioning the substrate in a factory interface of a cluster tool;

transferring the substrate from the factory interface to a first processing volume of a first epitaxial deposition chamber;

conducting a first epitaxial deposition operation on the substrate in the first epitaxial deposition chamber while maintaining the first processing volume at a first pressure, the first pressure less than 700 Torr;

maintaining a pressure of a pressure stabilization chamber at the first pressure;

transferring the substrate from the first epitaxial deposition chamber to the pressure stabilization chamber through a first door of the pressure stabilization chamber;

closing the first door;

increasing the pressure of the pressure stabilization chamber to a second pressure within a range of 700 Torr to 800 Torr;

opening a second door of the pressure stabilization chamber;

transferring the substrate from the pressure stabilization chamber to a second processing volume of a second epitaxial deposition chamber; and

conducting a second epitaxial deposition operation on the substrate while maintaining the second processing volume at the second pressure,

wherein the cluster tool comprises:

a first mainframe including a first transfer chamber;

one or more process chambers mounted to the first mainframe, the one or more process chambers including the first epitaxial deposition chamber;

a second mainframe including a second transfer chamber and the second epitaxial deposition chamber, the second mainframe coupled to the first mainframe;

the pressure stabilization chamber; and

a controller.

15. The method of claim 14, wherein the second epitaxial deposition operation is conducted on the substrate while maintaining the second processing volume at a temperature that is within a range of 400 degrees Celsius to 1,200 degrees Celsius.

16. The method of claim 14, wherein transferring the substrate from the first epitaxial deposition chamber to the pressure stabilization chamber further comprises:

transferring the substrate via the first transfer chamber while maintaining a pressure of the first transfer chamber at the first pressure; and

maintaining the second door of the pressure stabilization chamber closed while moving the substrate into the pressure stabilization chamber.

17. The method of claim 16, wherein:

the closed second door of the pressure stabilization chamber isolates the pressure stabilization chamber from the second transfer chamber; and

transferring the substrate from the first epitaxial deposition chamber to the pressure stabilization chamber further comprises maintaining a pressure of the second transfer chamber at the second pressure.

18. The method of claim 17, wherein the first door is maintained closed while opening the second door.

19. The method of claim 18, wherein transferring the substrate from the pressure stabilization chamber to the second processing volume of the second epitaxial deposition chamber further comprises transferring the substrate via the second transfer chamber.