

CLAIMS

1. A substrate processing system for treating a substrate, comprising:
a manifold;
a plurality of injector assemblies located in a processing chamber,
wherein each of the plurality of injector assemblies is in fluid communication with the manifold and includes a valve including an inlet and an outlet;
a dose controller configured to:
communicate with the valve in each of the plurality of injector assemblies;
and
adjust a pulse width supplied to the valve in each of the plurality of injector assemblies based on at least one of manufacturing differences between the valves in each of the plurality of injector assemblies and non-uniformities of the valves in each of the plurality of injector assemblies to cause a desired dose to be supplied from the valve in each of the plurality of injector assemblies.
2. The substrate processing system of claim 1, wherein each of the plurality of injector assemblies further includes a pressure sensor sensing pressure at the valve in each of the plurality of injector assemblies.
3. The substrate processing system of claim 2, wherein the dose controller is configured to adjust the respective pulse width for each valve based on the corresponding sensed pressure.
4. The substrate processing system of claim 1, wherein each of the plurality of injector assemblies further includes a temperature sensor sensing gas temperature at the valve in each of the plurality of injector assemblies.
5. The substrate processing system of claim 4, wherein the dose controller is configured to adjust the respective pulse width for each valve based on the corresponding sensed gas temperature.

6. The substrate processing system of claim 1, wherein the dose controller is configured to vary the pulse widths based on corresponding locations of the plurality of injector assemblies relative to the substrate.
7. The substrate processing system of claim 1, wherein the dose controller is configured to vary the pulse widths based on corresponding empirical data for the plurality of injector assemblies.
8. The substrate processing system of claim 1, further comprising a pressure regulator to regulate a pressure inside the manifold.
9. The substrate processing system of claim 1, wherein the dose controller is configured to adjust the pulse widths so as to cause the valves to provide approximately the same dose.
10. The substrate processing system of claim 1, wherein the dose controller is configured to adjust the pulse widths so as to cause the valves to provide different doses.
11. The substrate processing system of claim 1, wherein each of the plurality of injector assemblies further includes a restricted orifice.
12. The substrate processing system of claim 1, wherein each of the plurality of injector assemblies further includes a bypass valve having an inlet connected to the inlet of the valve.
13. The substrate processing system of claim 12, wherein each of the plurality of injector assemblies further includes a pressure sensor sensing pressure at the corresponding valve in each of the plurality of injector assemblies, and wherein the dose controller is configured to adjust the pulse widths for the valves and the bypass valves based on the corresponding sensed pressures.

14. The substrate processing system of claim 12, wherein each of the plurality of injector assemblies further includes a temperature sensor sensing gas temperature at the corresponding valve in each of the plurality of injector assemblies, and wherein the dose controller is configured to adjust the pulse widths for the valves and the bypass valves based on the corresponding sensed gas temperatures.

15. The substrate processing system of claim 12, wherein the dose controller is configured to vary the respective pulse width based on a desired overlap of the valve and the bypass valve for each of the plurality of injector assemblies.

16. The substrate processing system of claim 1, wherein the dose controller is configured to vary doses output by the plurality of injector assemblies to provide spatial skew.