CLAIMS

What is claimed is:

1. A system for delivering pulses of a desired mass of gas to a process chamber or tool, comprising:

a gas delivery chamber;

a first valve arranged so as to control the flow of gas into the gas delivery chamber;

a second valve arranged so as control the flow of gas leaving the gas delivery chamber so that the gas can leave the gas delivery chamber in pulses, each of a selected mass as a function of the initial pressure of the gas in the gas delivery chamber and the duration of the respective pulse; and

a pressure control arrangement configured and arranged so as to control the flow of gas into the gas delivery chamber so as to precharge the gas in the gas delivery chamber to an initial pressure set point prior to delivering the pulses of gas such that the variance of the starting pressure of the gas in the gas delivery chamber is controlled prior to delivering the pulses of gas, and the repeatability of the mass delivery is improved as a function of the duration of each of the pulses.

2. A system according to claim 1, further including a pressure transducer arranged so as to provide a pressure signal as a function of the pressure within the gas delivery chamber, wherein the pressure control arrangement includes a controller for controlling the flow of gas into the gas delivery system as a function of the pressure signal.

3. A system according to claim 1, further including a temperature sensor arranged so as to provide a temperature signal as a function of the gas temperature within the gas delivery chamber, wherein the pressure

control arrangement includes a controller for controlling the flow of gas into the gas delivery system as a function of the temperature signal.

4. A system according to claim 1, wherein the pressure control arrangement includes a first controller configured and arranged so as to control the flow of gas into and out of the gas delivery chamber as a function of the pressure within the gas delivery chamber;

5. A system according to claim 1, wherein the pressure control arrangement includes an antechamber constructed and arranged so as to receive the gas and selectively coupled to provide gas through the first valve into the gas delivery chamber by controlling the operation of the first valve so as to control the variance of the initial pressure set point of the gas in the gas delivery chamber before pulse gas delivery of pulses of gas.

6. A system according to claim 5, wherein the pressure control arrangement is further configured and arranged so as to control the first valve so as to control the flow of gas from the antechamber into the gas delivery chamber so as to control the variance of the initial pressure set point of the gas in the gas delivery chamber before pulse gas delivery of pulses of gas.

7. A system according to claim 5, further including a first pressure transducer arranged so as to provide a first pressure signal as a function of the pressure within the gas delivery chamber, and a second pressure transducer arranged so as to provide a second pressure signal as a function of the pressure within the antechamber, wherein the pressure control arrangement includes a controller for controlling the flow of gas into the gas delivery system as a function of the first and second pressure signals.

8. A system according to claim 7, further including a third valve arranged so as to control the flow into the antechamber, and wherein the pressure control arrangement is configure and arranged so as to control the third valve so as to control the flow of gas into the antechamber as a function of the second pressure signal, control the first valve so as to control the flow

of fluid from the antechamber into the gas delivery chamber as a function of the first and second pressure signals, and control the flow of gas leaving the gas delivery chamber as a function of the first pressure signal.

9. A system according to claim 8, wherein the controller arrangement includes a first controller configured and arranged so as to control the first and second valves, and a second controller configured and arranged so a to control the third valve, and a third controller configured and arranged so as to control the first and second controllers.

10. A system according to claim 5, wherein the antechamber is selectively coupled to the gas delivery chamber so as to charge the gas delivery chamber with the gas through the first valve.

11. A system according to claim 5, wherein the controller arrangement is configured and arranged so as to control the first control valve so as to maintain the pressure in the antechamber at a select pressure.

12. A system according to claim 11, wherein the initial pressure set point in the gas delivery chamber is a function of gas type and the selected mass of the pulse of gas to be delivered.

13. A method of delivering pulses of a desired mass of gas to a process chamber or tool, comprising:

controlling the flow of gas into the gas delivery chamber, and controlling the flow of gas leaving the gas delivery chamber so that the gas can leave the gas delivery chamber in pulses, each of a selected mass as a function of the initial pressure of the gas in the gas delivery chamber and the duration of the respective pulse; and

precharging the gas in the gas delivery chamber to an initial pressure set point prior to delivering the pulses of gas such that the variance of the starting pressure of the gas in the gas delivery chamber is controlled prior to

delivering the pulses of gas, and the repeatability of the mass delivery is improved as a function of the duration of each of the pulses.

14. A method according to claim 13, further including controlling the flow of gas into the gas delivery system as a function of the pressure within the gas delivery chamber.

15. A method according to claim 13, further including controlling the flow of gas into the gas delivery system as a function of the temperature of the gas within the gas delivery chamber.

16. A method according to claim 13, further including controlling the flow of gas into and out of the gas delivery chamber as a function of the pressure within the gas delivery chamber.

17. A method according to claim 13, further including receiving the gas in an antechamber and selectively controlling the gas flow from the antechamber into the gas delivery chamber by controlling the operation of a valve so as to control the variance of the initial pressure set point of the gas in the gas delivery chamber before pulse gas delivery of pulses of gas.

18. A method according to claim 17, further including controlling an inlet valve to the antechamber so as to control the flow of gas into the antechamber as a function of the pressure of gas within the antechamber, controlling an inlet valve to the gas delivery chamber so as to control the flow of gas from the antechamber into the gas delivery chamber as a function of the pressure within the antechamber and the pressure within the gas delivery chamber, and controlling an outlet valve so as to control the flow of fluid out of the gas delivery chamber.

19. A method according to claim 13, wherein the initial pressure set point is a function of gas type and the selected mass of the pulse of gas to be delivered.

CLAIMS:

1. A system for delivering pulses of a desired mass of gas to a process chamber or tool, comprising:

a gas delivery chamber;

a first valve arranged so as to control the flow of gas into the gas delivery chamber;

a second valve arranged so as control the flow of gas leaving the gas delivery chamber so that the gas can leave the gas delivery chamber in pulses, each of a selected mass as a function of the initial pressure of the gas in the gas delivery chamber; and

a pressure control arrangement configured and arranged so as to control the pressure of the gas flowing into the gas delivery chamber so as to precharge the gas in the gas delivery chamber to a substantially-constant initial starting pressure set point prior to delivering each of the pulses of gas, such that variance in the starting pressure of the gas in the gas delivery chamber is controlled prior to delivering each of the pulses of gas, thus improving the repeatability of the mass delivery as a function of the duration of each of the pulses,

wherein the pressure control arrangement includes an antechamber constructed and arranged so as to receive the gas and selectively coupled to provide the substantially-constant pressure gas supply through the first valve into the gas delivery chamber so as to control the variance of the initial pressure of the gas in the gas delivery chamber before delivery of each of the pulses of gas.

2. A system according to claim 1, further including a pressure transducer arranged so as to provide a pressure signal as a function of the pressure within the gas delivery chamber, wherein the pressure control arrangement includes a controller for controlling the flow of gas into the gas delivery system as a function of the pressure signal.

3. A system according to claim 1, further including a temperature sensor arranged so as to provide a temperature signal as a function of the gas temperature within the gas delivery chamber, wherein the pressure control arrangement includes a controller for controlling the flow of gas into the gas delivery system as a function of the temperature signal.

4. A system according to claim 1, wherein the pressure control arrangement includes a first controller configured and arranged so as to control the flow of gas into and out of the gas delivery chamber as a function of the pressure within the gas delivery chamber.

5. A system according to claim 1, wherein the pressure control arrangement is further configured and arranged so as to control the first valve so as to control the flow of gas from the antechamber into the gas delivery chamber so as to control the variance of the initial pressure of the gas in the gas delivery chamber before delivery of pulses of gas.

6. A system according to claim 1, further including a first pressure transducer arranged so as to provide a first pressure signal as a function of the pressure within the gas delivery chamber, and a second pressure transducer arranged so as to provide a second pressure signal as a function of the pressure within the antechamber, wherein the pressure control arrangement includes a controller for controlling the flow of gas into the gas delivery system as a function of the first and second pressure signals.

7. A system according to claim 6, further including a third valve arranged so as to control the flow into the antechamber, and wherein the pressure control arrangement is configure and arranged so as to control the third valve so as to control the flow of gas into the antechamber as a function of the second pressure signal, control the first valve so as to control the flow of fluid from the antechamber into the gas delivery chamber as a function of the first and second pressure signals, and control the flow of gas leaving the gas delivery chamber as a function of the first pressure signal.

8. A system according to claim 7, wherein the controller arrangement includes a first controller configured and arranged so as to control the first and second valves, and a second controller configured and arranged so a to control the third valve, and a third controller configured and arranged so as to control the first and second controllers.

9. A system according to claim 1, wherein the antechamber is selectively coupled to the gas delivery chamber so as to charge the gas delivery chamber with the gas through the first valve.

10. A system according to claim 1, wherein the controller arrangement is configured and arranged so as to control the third valve so as to maintain the pressure in the antechamber at a select pressure.

11. A system according to claim 10, wherein the initial pressure set point in the gas delivery chamber is a function of gas type and the selected mass of the pulse of gas to be delivered.

12. A system according to claim 1, wherein the system is for delivering pulses of a desired mass of gas to a wafer in a process chamber or tool.

13. A system according to claim 1, wherein the system is for delivering pulses of a desired mass of gas to a substrate in a process chamber or tool.

14. A system according to claim 1, wherein the system is for delivering pulses of a desired mass of gas to a semiconductor tool.

15. A system according to claim 1, wherein the system is for delivering pulses of a desired mass of gas to a semiconductor processing chamber.

16. A system according to claim 1, wherein the system is for delivering pulses of a desired mass of gas to a plasma etching machine.

17. A system according to claim 1, wherein the pressure control arrangement causes the first valve to close when the initial starting pressure set point is reached.