CLAIMS

1. A method, comprising:

flowing a first gas comprising a precursor and a dilution gas through a first delivery main line, wherein the first delivery main line is fluidly coupled with a first delivery subline and a second delivery subline downstream of the first delivery main line, the first delivery subline configured to provide fluid access to a first semiconductor processing chamber from the first delivery main line, the second delivery subline configured to provide fluid access to a second semiconductor processing chamber from the first delivery main line;

flowing a second gas comprising the dilution gas through a second delivery main line, wherein the second delivery main line is fluidly coupled with a third delivery subline and a fourth delivery subline downstream of the second delivery main line, the third delivery subline configured to provide fluid access to the first semiconductor processing chamber from the second delivery main line, the fourth delivery subline configured to provide fluid access to the second semiconductor processing chamber from the second delivery main line;

measuring a concentration of the precursor contained in the first gas delivered through the first delivery main line;

adjusting a first flow rate of the first gas delivered through the first delivery subline based at least in part on the measured concentration of the precursor;

adjusting a second flow rate of the first gas delivered through the second delivery subline based at least in part on the measured concentration of the precursor;

delivering, to the first semiconductor processing chamber in accordance with a first recipe set point, a first mixture of the first gas delivered through the first delivery subline and the second gas; and

delivering, to the second semiconductor processing chamber in accordance with a second recipe set point, a second mixture of the first gas delivered through the second delivery subline and the second gas, wherein the first mixture and the second mixture are simultaneously delivered to the first semiconductor processing chamber and the second semiconductor processing chamber, respectively, wherein:

delivering the first mixture of the first gas delivered through the first delivery subline and the second gas comprises delivering the first mixture of the first gas delivered

through the first delivery subline and the second gas delivered through the third delivery subline; and

delivering the second mixture of the first gas delivered through the second delivery subline and the second gas comprises delivering the second mixture of the first gas delivered through the second delivery subline and the second gas delivered through the fourth delivery subline.

2. The method of claim 1, wherein the precursor comprises diborane.

3. The method of claim 1, wherein the dilution gas comprises hydrogen.

4. The method of claim 1, wherein the concentration of the precursor is measured using an optical absorption sensor.

5. The method of claim 4, wherein the optical absorption sensor comprises an elongate optical cell configured to direct the first gas to flow through at least a portion of the elongate optical cell along a longitudinal axis of the elongate optical cell while the concentration of the precursor contained in the first gas is measured by the optical absorption sensor.

6. The method of claim 5, wherein the optical absorption sensor comprises an optical filter defining a first end of the elongate optical cell, and wherein the optical filter is configured to allow infrared radiation having one or more of the following wavenumbers to pass through: 1,600±100 cm^{-1} or 2,520±100 cm^{-1}.

7. The method of claim 5, wherein the optical absorption sensor comprises an optical window defining a second end of the elongate optical cell, and wherein light entering into the elongate optical cell through the optical window comprises infrared radiation having a wavenumber ranging between 400 cm^{-1} and 3,000 cm^{-1}.

8. The method of claim 1, wherein the first recipe set point defines a first concentration of the precursor contained in the first mixture of the first gas and the second gas, and wherein the second recipe set point defines a second concentration of the precursor contained in the second mixture of the first gas and the second gas.

9. The method of claim 1, further comprising:

adjusting a first flow rate of the second gas delivered through the third delivery subline based at least in part on the measured concentration of the precursor; and

adjusting a second flow rate of the second gas delivered through the fourth delivery subline based at least in part on the measured concentration of the precursor.

10. A precursor delivery system, comprising:

a first delivery main line configured to deliver a first gas;

a precursor sensor configured to measure a concentration of a precursor contained in the first gas delivered through the first delivery main line;

a first delivery subline and a second delivery subline fluidly coupled with and downstream of the first delivery main line, the first delivery subline configured to provide fluid access to a first semiconductor processing chamber from the first delivery main line, the second delivery subline configured to provide fluid access to a second semiconductor processing chamber from the first delivery main line, wherein the first delivery subline comprises a first flow controller configured to control a first flow rate of the first gas flowed into the first semiconductor processing chamber, and wherein the second delivery subline comprises a second flow controller configured to control a second flow rate of the first gas flowed into the second semiconductor processing chamber; and

a precursor delivery controller communicatively coupled with the precursor sensor, the first flow controller, and the second flow controller, wherein the precursor delivery controller is configured to control the first flow controller based on the measured concentration of the precursor so as to deliver a first mixture of the first gas and a second gas to the first semiconductor processing chamber in accordance with a first recipe set point, and wherein the precursor delivery controller is further configured to control the second flow controller based on the measured concentration of the precursor so as to deliver a second mixture of the first gas and the second gas to the second semiconductor processing chamber in accordance with a second recipe set point.

11. The precursor delivery system of claim 10, wherein the precursor delivery system is configured to deliver the first mixture to the first semiconductor processing chamber and the second mixture to the second semiconductor processing chamber simultaneously.

12. The precursor delivery system of claim 10, wherein the precursor comprises diborane, wherein the first gas further comprises hydrogen, and wherein the second gas comprises hydrogen.

13. The precursor delivery system of claim 10, wherein the precursor sensor comprises an optical absorption sensor.

14. The precursor delivery system of claim 13, wherein the optical absorption sensor comprises an elongate optical cell configured to direct the first gas to flow through at least a portion of the elongate optical cell along a longitudinal axis of the elongate optical cell while the concentration of the precursor contained in the first gas is measured by the optical absorption sensor.

15. The precursor delivery system of claim 14, wherein the optical absorption sensor comprises an optical filter defining a first end of the elongate optical cell, and wherein the optical filter is configured to allow infrared radiation having one or more of the following wavenumbers to pass through: 1,600±100 cm^{-1} or 2,520±100 cm^{-1}.

16. The precursor delivery system of claim 14, wherein the optical absorption sensor comprises an optical window defining a second end of the elongate optical cell, and wherein light entering into the elongate optical cell through the optical window comprises infrared radiation having a wavenumber ranging between 400 cm^{-1} and 3,000 cm^{-1}.

17. The precursor delivery system of claim 14, wherein the optical absorption sensor further comprises at least one of a pressure sensor configured to measure a pressure inside the elongate optical cell or a temperature sensor configured to measure a temperature inside the elongate optical cell.

18. The precursor delivery system of claim 10, wherein the precursor delivery system further comprises:

a second delivery main line configured to deliver the second gas;

a third delivery subline and a fourth delivery subline fluidly coupled with and downstream of the second delivery main line, the third delivery subline configured to provide fluid access to the first semiconductor processing chamber from the second delivery main line, the fourth delivery subline configured to provide fluid access to the second semiconductor processing chamber from the second delivery main line, wherein the third delivery subline comprises a third flow controller configured to control a first flow rate of the second gas flowed into the first semiconductor processing chamber, and wherein the fourth delivery subline comprises a fourth flow controller configured to control a second flow rate of the second gas flowed into the second semiconductor processing chamber;

wherein the precursor delivery controller is further communicatively coupled with the third flow controller and the fourth flow controller, wherein the precursor delivery controller is

further configured to control the third flow controller based on the measured concentration of the precursor so as to deliver the first mixture to the first semiconductor processing chamber in accordance with the first recipe set point, and wherein the precursor delivery controller is further configured to control the fourth flow controller based on the measured concentration of the precursor so as to deliver the second mixture to the second semiconductor processing chamber in accordance with the second recipe set point.

19. The precursor delivery system of claim 10, wherein the first recipe set point defines a first concentration of the precursor contained in the first mixture of the first gas and the second gas, and wherein the second recipe set point defines a second concentration of the precursor contained in the second mixture of the first gas and the second gas.

20. A semiconductor processing system, comprising:

a first semiconductor processing chamber and a second semiconductor processing chamber arranged in a tandem section of the semiconductor processing system; and

a precursor delivery system, the precursor delivery system comprising:

a first delivery main line configured to deliver a first gas, the first delivery main line fluidly coupled with a first delivery subline and a second delivery subline, the first delivery subline comprising a first flow controller and configured to provide fluid access to the first semiconductor processing chamber from the first delivery main line, the second delivery subline comprising a second flow controller and configured to provide fluid access to the second semiconductor processing chamber from the first delivery main line;

an optical absorption sensor installed along the first delivery main line and configured to measure a concentration of a precursor contained in the first gas;

a second delivery main line configured to deliver a second gas, the second delivery main line fluidly coupled with a third delivery subline fluidly and a fourth delivery subline, the third delivery subline comprising a third flow controller and configured to provide fluid access to the first semiconductor processing chamber from the second delivery main line, the fourth delivery subline comprising a fourth flow controller and configured to provide fluid access to the second semiconductor processing chamber from the second delivery main line; and

a precursor delivery controller communicatively coupled with the optical absorption sensor and the first, second, third, and fourth flow controllers, wherein the precursor delivery controller is configured to control the first and third flow controllers based on the measured concentration of the precursor so as to deliver a first mixture of the first and second gases to the first semiconductor processing chamber according to a first recipe set point, wherein the precursor delivery controller is further configured to control the second and fourth flow controllers based on the measured concentration of the precursor so as to deliver a second mixture of the first gas and the second gas to the second semiconductor processing chamber according to a second recipe set point, and wherein the precursor delivery system is configured to deliver the first mixture and the second mixture simultaneously.