METHOD AND APPARATUS FOR GAS AND VAPOR DEPOSITION PRECURSOR DELIVERY

CLAIM FOR PRIORITY

[0001] This application is a continuation of, and claims the benefit of priority to U.S. Patent Application No. 63/283,892, filed on November 29, 2021, titled "METHOD AND APPARATUS FOR GAS AND VAPOR DEPOSITION PRECURSOR DELIVERY HEATER," and which is incorporated by reference in its entirety.

BACKGROUND

[0002] Substrate processing systems are used to perform treatments such as deposition and etching of film on substrates like semiconductor wafers. For example, deposition may be performed to deposit a conductive film, a dielectric film, or other types of film using chemical vapor deposition (CVD), plasma enhanced CVD (PECVD), atomic layer deposition (ALD), plasma enhanced ALD (PEALD), and/or other deposition processes. During deposition, the substrate is arranged on a substrate support (e.g., a pedestal). One or more precursor gases may be supplied to a processing chamber using a gas distribution device (e.g., a showerhead) during one or more process steps. The gas distribution device may be interconnected to a gas line network.

[0003] Such networks may be employed for precursor delivery within chemical vapor and atomic layer deposition equipment, for example. Multiple gas delivery lines may be connected to construct complex gas line networks. The complex gas line networks comprise interconnected linear tube segments between gas sources and deposition chambers. Linear tubing segments may be joined together at multiple angles to form compound gas delivery lines having complex three-dimensional geometries. The choice of particular gas delivery line geometries may depend on a particular design of a deposition apparatus. For example, particular gas delivery line geometries may depend on a number and positions of sources and chambers.

[0004] Existing precursor or gas delivery heating systems may be inadequate and cumbersome for heating delivery lines to the showerhead for material processing. Lines are often heated with either heater blocks or wrap heaters. With the current heater blocks system, multiple cartridge heaters are inserted into the block and multiple sets of temperature control devices need to be employed, making the system cumbersome. In the case of heater wrap