station processing tool that comprises two or more processing stations. The multi-station processing tool further comprises a precursor source. The multi-station processing tool further comprises a dose-divert valve assembly operable to selectively direct a precursor flow received from the precursor source between a dose path or a divert path. The dose-divert valve assembly includes a precursor inlet to receive the precursor flow from the precursor source. The dose-divert valve assembly further includes a dose valve operable to selectively provide the precursor flow to the dose path. The dose-divert valve assembly further includes a divert valve operable to selectively provide the precursor flow to the divert path. The multi-station processing tool further comprises a dose line comprising two or more branches. The dose line is connected to the dose valve. Each branch of the dose line fluidly couples the precursor source with a corresponding processing station of the two or more processing stations.

[0004] In some such examples, the dose-divert valve assembly is a first dose-divert valve assembly. The dose path comprises a dose manifold to which the first dose-divert valve assembly is coupled. The precursor source is a first precursor source. The multi-station processing tool further comprises a second precursor source and a second dose-divert valve assembly. The second dose-divert valve assembly is fluidly coupled with the second precursor source and with the dose manifold.

[0005] Additionally or alternatively, in some such examples, the dose manifold further includes a purge gas inlet to receive a purge gas from a purge gas source.

[0006] Additionally or alternatively, in some such examples, the divert path comprises a divert manifold to which the first dose-divert valve assembly and the second dose-divert valve assembly are fluidly coupled. The multi-station processing tool further comprises a divert line connected to the divert manifold.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] FIG. 1 schematically depicts an example of a multi-station processing tool for performing atomic layer deposition.

[0024] FIGS. 2A – 2H schematically depict example configurations of the multi-station processing tool of FIG. 1.

[0025] FIG. 3 schematically depicts an example configuration of a precursor distribution system of the multi-station processing tool of FIG. 1.

[0026] FIG. 4 depicts an example of a portion of the precursor distribution system according to the configuration of FIG. 3 in which various components are integrated with a manifold body.

[0027] FIG. 5 is a flow diagram depicting an example method of operating a dose-divert valve assembly in an ALD tool.

[0028] FIG. 6 schematically depicts an example computing system.

DETAILED DESCRIPTION

[0029] The term “assembly” generally represents a collection of two or more objects or components. The term “dose and divert valve assembly” generally represents an assembly that comprises a dose valve and a divert valve.

[0030] The term “atomic layer deposition” (ALD) generally represents a process in which a film is formed on a substrate in one or more individual layers by sequentially adsorbing a precursor conformally to the substrate and reacting the adsorbed precursor to form a film layer. Examples of ALD processes comprise plasma-enhanced ALD (PEALD) and thermal ALD (TALD). PEALD and TALD respectively utilize a plasma of a reactive gas and heat to facilitate a chemical conversion of a

precursor adsorbed to a substrate to a film on the substrate. The terms “growth” and “deposition”, and variants thereof, also can be used to refer to film formation.

[0031] The term “divert” generally represents the act or function of directing a material or object away from another path.

[0032] The term “divert valve” generally represents a machine configured to selectively direct the flow of a fluid to a divert path.

[0033] The term “dose” generally represents exposing a substrate to a precursor for a duration.

[0034] The term “dose valve” generally represents a machine configured to selectively direct a flow of a fluid to a dose path.

[0035] The term “fluid communication” generally represents a structural configuration that enables a fluid substance, such as a liquid or gas, to flow from one location to another.

[0036] The term “manifold” generally represents a machine or structure that connects or combines multiple inputs or outputs.

[0037] The term “plasma” generally represents a gas comprising cations and free electrons. A plasma can be used to generate reactive chemical species from a precursor molecule introduced into the plasma.

[0038] The term “plasma generator” generally represents hardware configured to form a plasma for processing a substrate in a processing chamber.

[0039] The term “precursor” generally represents a chemical compound that participates in a chemical reaction to produce a product compound.

[0040] The term “processing chamber” generally represents an enclosure in which chemical and/or physical processes are performed on substrates. The pressure,

precursor source between a dose path fluidly coupled with two or more processing stations and a divert path fluidly coupled with exhaust system 131.

[0074] FIG. 3 schematically depicts an example configuration of precursor distribution system 120 of FIG. 1. Dose-divert valve assemblies 130-1 through 130-N include precursor inlets 310-1 through 310-N. Each precursor inlet 310-1 through 310-N is configured to receive a precursor flow from a respective precursor source 118-1 through 118-N. Here, dose-divert valve assembly 130-1 receives first precursor flow 330-1 from first precursor source 118-1 through precursor inlet 310-1. Dose-divert valve assembly 130-2 receives second precursor flow 330-2 from second precursor source 118-2 through precursor inlet 310-2. Dose-divert valve assembly 130-N receives Nth precursor flow 330-N from Nth precursor source 118-N through precursor inlet 310-N. Precursor sources 118-1 through 118-N contain different precursors in this example.

[0075] Each of dose-divert valve assemblies 130-1 through 130-N includes a dose valve operable to selectively provide the precursor flow received through the precursor inlet to a dose path. For example, dose valve 314-1 of dose-divert valve assembly 130-1 is operable to selectively provide precursor flow 330-1 received through precursor inlet 310-1 to dose path 316-1. Dose valve 314-2 of dose-divert valve assembly 130-2 is operable to selectively provide precursor flow 330-2 received through precursor inlet 310-2 to dose path 316-2. Dose valve 314-N of dose-divert valve assembly 130-N is operable to selectively provide precursor flow 330-N received through precursor inlet 310-N to dose path 316-N.

[0076] Each of dose-divert valve assemblies 130-1 through 130-N includes a divert valve operable to selectively provide the precursor flow received through precursor inlet to a divert path. For example, divert valve 318-1 of dose-divert valve