chamber. As a result of changes in the optical properties of the quartz chamber, excess heating of the reaction chamber may occur due to IR absorption during the course of a growth cycle.

[0005] Systems and methods are therefore desirable to reduce the formation of undesirable deposits within semiconductor deposition systems.

BRIEF SUMMARY

[0006] This summary is provided to introduce a selection of concepts in a simplified form, such concepts being further described in the detailed description below of some example embodiments of the invention. This summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

[0007] In some embodiments, the present disclosure includes methods for controlling undesired deposits within a reaction chamber associated with a semiconductor deposition system. The methods of the embodiments may comprise heating a cleaning gas by flowing the cleaning gas through at least one gas flow path extending through at least one gas furnace. Methods may also include introducing the cleaning gas into the reaction chamber through a precursor injector and removing at least a portion of the undesired deposits from within the reaction chamber by reacting the cleaning gas with the portion of the undesired deposits to form a reaction product and exhausting the reaction product from the reaction chamber through an exhaust channel.

[0008] Embodiments may also include systems for controlling undesired deposits within a reaction chamber associated with a semiconductor deposition system, such systems may include, a source of cleaning gas, a gas heating apparatus for heating the cleaning gas, the gas heating apparatus comprising at least one gas flow path extending through at least one gas furnace, wherein the at least one gas flow path includes at least one section having a serpentine configuration. The system may also include an at least substantially enclosed reaction chamber defined by a top wall, a bottom wall, and at least one side wall, the reaction chamber being in fluidic communication with the gas heating apparatus.

~~[0008a] In one aspect, there is provided a method for reducing undesired deposits within a reaction chamber associated with a semiconductor deposition system, the method comprising:~~

[008a] In one aspect, there is provided a method for reducing undesired deposits within a reaction chamber associated with a III-nitride HVPE semiconductor deposition system configured with an external source of group III precursor, the method comprising:

heating a cleaning gas by flowing the cleaning gas through at least one gas flow path extending through at least one percursor gas furnace;

introducing the cleaning gas into the reaction chamber through a process gas injector; and

removing at least a portion of the undesired deposits from within the reaction chamber by reacting the cleaning gas with the portion of the undesired deposits to form at least one reaction product and exhausting the at least one reaction product from the reaction chamber.

[0008b] In another aspect, there is provided a system for controlling undesired deposits within a reaction chamber associated with a III-nitride HVPE semiconductor deposition system configured with an external source of a group III precursor, the system comprising:

a source of cleaning gas;

a gas heating apparatus for heating the cleaning gas coupled with the source of cleaning gas, the gas heating apparatus comprising at least one gas flow path extending through at least one gas furnace; and

an at least substantially enclosed reaction chamber defined by a top wall, a bottom wall, and at least one side wall, the reaction chamber being in fluidic communication with the gas heating apparatus.

CLAIMS

What is claimed is:

1. A method for reducing undesired deposits within a reaction chamber associated with a III-nitride HVPE semiconductor deposition system configured with an external source of group III precursor, the method comprising:

heating a cleaning gas by flowing the cleaning gas through at least one gas flow path extending through at least one precursor gas furnace;

introducing the cleaning gas into the reaction chamber through a process gas injector; and

removing at least a portion of the undesired deposits from within the reaction chamber by reacting the cleaning gas with the portion of the undesired deposits to form at least one reaction product and exhausting the at least one reaction product from the reaction chamber.

2. The method of claim 1, futher comprising selecting the cleaning gas to comprise one or more of a chlorine containing gas and hydrogen gas.

3. The method of claim 1, wherein flowing the cleaning gas through the at least one gas flow path extending through at least one gas furnace further comprises flowing the cleaning gas through at least one gas flow path section having a coil configuration.

4. The method of claim 1, further comprising heating the cleaning gas to a temperature of approximately 600°C or more.

5. The method of claim 1, wherein removing a least a portion of undesired deposits further comprises:

removing a portion of the undesired deposits preferentially from a first zone within the reaction chamber in a first cleaning stage; and

subsequently removing a portion of the undesired deposits preferentially from within a second zone of the reaction chamber in a second cleaning stage.

6. The method of claim 5, wherein removing a portion of the undesired deposits preferentially from a first zone within the reaction chamber comprises preferentially removing a portion of the undesired deposits disposed more proximate to the process gas injector than to an exhaust channel of the reaction chamber.

7. The method of claim 5, wherein removing a portion of the undesired deposits preferentially from a second zone within the reaction chamber comprises preferentially removing a portion of the undesired deposits disposed more proximate to an exhaust channel of the reaction chamber than to the process gas injector.

8. The method of claim 1, further comprising removing at least a portion of a residual cleaning gas from within the reaction chamber after removing at least a portion of the undesired deposits from within the reaction chamber.

9. The method of claim 8, wherein removing at least a portion of the residual cleaning gas from within the reaction chamber further comprises purging the reaction chamber one or more times, wherein purging the reaction chamber one or more times includes purging the reaction chamber with at least one of an inert gas and an active gas.

10. A system for controlling undesired deposits within a reaction chamber associated with a III-nitride HVPE semiconductor deposition system configured with an external source of group III precursor, the system comprising:

a source of cleaning gas;

a gas heating apparatus for heating the cleaning gas coupled with the source of cleaning gas, the gas heating apparatus comprising at least one gas flow path extending through at least one gas furnace and

an at least substantially enclosed reaction chamber defined by a top wall, a bottom wall, and at least one side wall, the reaction chamber being in fluidic communication with the gas heating apparatus.

11. The system of claim 10, wherein the source of cleaning gas comprises one or more of a chlorine containing gas and hydrogen gas.