[0010] According to an aspect of the present invention, there is provided a deposition system, comprising: a reaction chamber including a top wall, a bottom wall, and at least one side wall extending between the top wall and the bottom wall; at least one thermal radiation emitter disposed adjacent the bottom wall, said emitter being configured to emit thermal radiation within a range of wavelengths of electromagnetic radiation in at least one of the infrared region and the visible region of the electromagnetic radiation spectrum through at least one chamber wall of the reaction chamber and into an interior of the reaction chamber, the bottom wall of the reaction chamber comprising a transparent material at least substantially transparent to electromagnetic radiation over the range of wavelengths, the bottom wall comprising transparent quartz; at least one metrology device including a sensor located outside the reaction chamber and oriented and configured to receive an electromagnetic radiation signal at one or more wavelengths within the range of wavelengths passing from an interior of the reaction chamber to an exterior of the reaction chamber; and at least one volume of opaque material, the opaque material being opaque to wavelengths of electromagnetic radiation within the range of wavelengths, the at least one volume of the opaque material located to prevent at least some thermal radiation to be emitted by the at least one thermal radiation emitter from being detected by the sensor of the at least one metrology device, at least a portion of the top wall comprises the at least one volume of opaque material, the opaque material comprises opaque quartz, wherein the at least one volume of opaque material is an integral portion of at least the top wall of the reaction chamber.

[0011] According to another aspect of the present invention, there is provided a method of forming a deposition system, comprising: positioning at least one thermal radiation emitter outside and proximate to a reaction chamber including a top wall, a bottom wall, and

at least one side wall extending between the top wall and the bottom wall; orienting the at least one thermal radiation emitter to emit thermal radiation through at least one chamber wall of the one or more chamber walls and into an interior of the reaction chamber;
selecting the at least one thermal radiation emitter to comprise an emitter configured to emit thermal radiation within a range of wavelengths of electromagnetic radiation in at least one of the infrared region and the visible region of the electromagnetic radiation spectrum; selecting the bottom wall to comprise a transparent material at least substantially transparent to electromagnetic radiation over the range of wavelengths, the transparent material comprises quartz material; positioning a sensor of at least one metrology device outside and proximate to the reaction chamber; orienting the sensor to receive an electromagnetic radiation signal passing from an interior of the reaction chamber to an exterior of the reaction chamber; selecting the sensor to comprise a sensor configured to detect the electromagnetic radiation signal at one or more wavelengths within the range of wavelengths; providing at least one volume of opaque material at a location preventing at least some thermal radiation to be emitted by the at least one thermal radiation emitter from being detected by the sensor of the at least one metrology device; and selecting the opaque material to comprise a material opaque to wavelengths of electromagnetic radiation within the range of wavelengths,selecting the top wall to comprise the at least one volume of opaque material, wherein the opaque material comprises opaque quartz, and wherein the at least one volume of opaque material is an integral portion of at least the top wall of the reaction chamber.

[0012] The present disclosure also includes methods of depositing material on workpiece substrates using deposition systems. At least one workpiece substrate may be positioned within an interior of a reaction chamber. Thermal radiation may be emitted into the interior of the reaction chamber from at least one thermal radiation emitter located outside the reaction chamber through at least a portion of one or more chamber walls of the reaction chamber. The one or more chamber walls through which the thermal radiation is emitted may comprise a transparent material that is transparent to the thermal radiation. At least one process gas may be introduced into the reaction chamber. At least one of the workpiece substrate and the at least one process gas may be heated by the thermal radiation. Material may be deposited on the at least one workpiece substrate from the at least one process gas. A sensor of at least one metrology device may be used to sense an electromagnetic radiation signal representative of at least one characteristic of the workpiece substrate. The sensor may be located outside and proximate to the reaction chamber. The electromagnetic radiation signal sensed by the sensor may pass from the interior of the reaction chamber to the sensor through one or more chamber walls of the reaction chamber transparent to the electromagnetic radiation signal. The sensor may be shielded from at least some of the thermal radiation emitted by the thermal radiation emitter using at least one volume of opaque material.

CLAIMS

1. A deposition system, comprising:

a reaction chamber including a top wall, a bottom wall, and at least one side wall extending between the top wall and the bottom wall;

at least one thermal radiation emitter disposed adjacent the bottom wall, said emitter being configured to emit thermal radiation within a range of wavelengths of electromagnetic radiation in at least one of the infrared region and the visible region of the electromagnetic radiation spectrum through at least one chamber wall of the reaction chamber and into an interior of the reaction chamber, the bottom wall of the reaction chamber comprising a transparent material at least substantially transparent to electromagnetic radiation over the range of wavelengths, the bottom wall comprising transparent quartz;

at least one metrology device including a sensor located outside the reaction chamber and oriented and configured to receive an electromagnetic radiation signal at one or more wavelengths within the range of wavelengths passing from an interior of the reaction chamber to an exterior of the reaction chamber; and

at least one volume of opaque material, the opaque material being opaque to wavelengths of electromagnetic radiation within the range of wavelengths, the at least one volume of the opaque material located to prevent at least some thermal radiation to be emitted by the at least one thermal radiation emitter from being detected by the sensor of the at least one metrology device, at least a portion of the top wall comprises the at least one volume of opaque material, the opaque material comprises opaque quartz, wherein the at least one volume of opaque material is an integral portion of at least the top wall of the reaction chamber.

2. The deposition system of claim 1, wherein the at least one volume of opaque material comprises at least a portion of a chamber wall of the one or more chamber walls.

3. The deposition system of claim 1, further comprising a body positioned within the interior of the reaction chamber, the body comprising the at least one volume of opaque material.

positioning a sensor of at least one metrology device outside and proximate to the reaction chamber;

orienting the sensor to receive an electromagnetic radiation signal passing from an interior of the reaction chamber to an exterior of the reaction chamber;

selecting the sensor to comprise a sensor configured to detect the electromagnetic radiation signal at one or more wavelengths within the range of wavelengths;

providing at least one volume of opaque material at a location preventing at least some thermal radiation to be emitted by the at least one thermal radiation emitter from being detected by the sensor of the at least one metrology device; and

selecting the opaque material to comprise a material opaque to wavelengths of electromagnetic radiation within the range of wavelengths,

selecting the top wall to comprise the at least one volume of opaque material, wherein the opaque material comprises opaque quartz, and wherein the at least one volume of opaque material is an integral portion of at least the top wall of the reaction chamber.

8. The method of claim 7, further comprising selecting at least one chamber wall of the one or more chamber walls to comprise the at least one volume of opaque material.

9. The method of claim 7, further comprising:

positioning a body within the interior of the reaction chamber; and

selecting the body to comprise the at least one volume of opaque material.

10. The method of claim 7, further comprising selecting the at least one side wall to comprise the at least one volume of opaque material, and wherein the opaque material comprises opaque quartz.

11. The method of claim 7, further comprising;

positioning the sensor of the at least one metrology device adjacent the top wall,

selecting the top wall to comprise the at least one volume of opaque material, wherein the opaque material comprises opaque quartz, and