Claims:

1. An apparatus for thermal management of a precursor for use in substrate processing, comprising:

a body having an opening sized to receive a storage container having a liquid or solid precursor disposed therein, the body fabricated from thermally conductive material;

one or more thermoelectric devices coupled to the body proximate the opening; and

one or more heat sinks coupled to the one or more thermoelectric devices.

2. The apparatus of claim 1, wherein the body is made of aluminum, copper or brass.

3. The apparatus of claim 1, further comprising:

a thermally insulative material disposed on one or more outer surfaces of the body.

4. The apparatus of any of claims 1 to 3, wherein the body comprises two separable parts, wherein the opening is at least partially formed in each of the two separable parts.

5. The apparatus of claim 4, further comprising:

a thermally conductive plate coupled to each part of the body on at least one of a first side of the body or a second side of the body, opposite the first side.

6. The apparatus of claim 5, further comprising:

a thermally insulative material disposed on an outer surface of the thermally conductive plate.

7. The apparatus of any of claims 1 to 3, wherein the one or more thermoelectric devices comprises at least two thermoelectric devices, wherein at least one

thermoelectric device is disposed on opposing sides of the body proximate the opening.

8. The apparatus of claim 7, wherein the at least two thermoelectric devices comprises four thermoelectric devices disposed on opposing sides of the body proximate the opening.

9. The apparatus of any of claims 1 to 3, wherein the one or more thermoelectric devices comprise at least two thermoelectric devices stacked atop one another to provide a thermal gradient across the body.

10. The apparatus of any of claims 1 to 3, wherein the storage container comprises one or more ports configured to be coupled to conduits for providing the solid or liquid precursor to the storage container.

11. The apparatus of any of claims 1 to 3, further comprising:

a thermally insulative material disposed between the one or more heat sinks and the body such that each heat sink is substantially only thermally coupled to the one or more thermoelectric devices.

12. The apparatus of any of claims 1 to 3, wherein the one or more thermoelectric devices are at least partially set into the body.

13. The apparatus of any of claims 1 to 3, wherein the body further comprises one or more recesses formed in the body configured to route electrical cables for operation of the one or more thermoelectrical devices.

14. The apparatus of any of claims 1 to 3, further comprising:

a thermocouple coupled to the body to measure a temperature of the storage container.

15. The apparatus of any of claims 1 to 3, further comprising:

one or more fans disposed proximate to a back side of the one or more heat sinks to provide a flow of air to the one or more heat sinks.

CLAIMS

1. An apparatus for thermal management of a precursor for use in substrate processing, comprising:

a body having an opening sized to receive a storage container having a liquid or solid precursor disposed therein, the body fabricated from thermally conductive material, wherein the body comprises two separable parts, and wherein the opening is at least partially formed in each of the two separable parts;

one or more thermoelectric devices coupled to the body proximate the opening; and

a heat sink coupled to the one or more thermoelectric devices.

2. The apparatus of claim 1, wherein the body is made of aluminum, copper or brass.

3. The apparatus of claim 1, further comprising:

a thermally insulative material disposed on one or more outer surfaces of the body.

4. The apparatus of claim 1, further comprising:

a thermally conductive plate coupled to each part of the body on at least one of a first side of the body or a second side of the body, opposite the first side.

5. The apparatus of claim 4, further comprising:

a thermally insulative material disposed on an outer surface of the thermally conductive plate.

6. The apparatus of claim 1, wherein the one or more thermoelectric devices comprises at least two thermoelectric devices, wherein at least one thermoelectric device is disposed on opposing sides of the body proximate the opening.

7 The apparatus of claim 6, wherein the at least two thermoelectric devices comprises four thermoelectric devices disposed on opposing sides of the body proximate the opening.

8. The apparatus of claim 1, wherein the one or more thermoelectric devices comprise at least two thermoelectric devices stacked atop one another to provide a thermal gradient across the body.

9. The apparatus of claim 1, wherein the storage container comprises one or more ports configured to be coupled to conduits for providing the liquid or solid precursor to the storage container.

10. The apparatus of claim 1, further comprising:

a thermally insulative material disposed between the heat sink and the body such that the heat sink is substantially only thermally coupled to the one or more thermoelectric devices.

11. The apparatus of claim 1, wherein the one or more thermoelectric devices are at least partially set into the body, and wherein the body further comprises one or more recesses formed in the body configured to route electrical cables for operation of the one or more thermoelectric devices.

12. The apparatus of claim 1, further comprising:

a thermocouple coupled to the body to measure a temperature of the storage container.

13. An apparatus for thermal management of a precursor for use in substrate processing, comprising:

a body having an opening sized to receive a storage container having a liquid or solid precursor disposed therein, the body fabricated from thermally conductive material

wherein the storage container comprises one or more ports configured to be coupled to conduits for providing the liquid or solid precursor to the storage container;

one or more thermoelectric devices coupled to the body proximate the opening; and

a heat sink coupled to the one or more thermoelectric devices.

14. An apparatus for thermal management of a precursor for use in substrate processing, comprising:

a body fabricated from a thermally conductive material, the body comprising two separable parts and an opening sized to receive a storage container at least partially formed in each of the two separable parts, wherein the storage container is configured to contain a liquid or solid precursor;

one or more thermoelectric devices coupled to the body proximate the opening;

a heat sink coupled to the one or more thermoelectric devices; and

a thermally conductive plate coupled to each of the two separable parts of the body on a first side of the body and a second side of the body, opposite the first side.

15. The apparatus of claim 14, further comprising:

a thermally insulative material disposed on one or more outer surfaces of the body.

16. The apparatus of claim 15, further comprising:

a thermally insulative material disposed on an outer surface of the thermally conductive plate.

17. The apparatus of claim 14, further comprising:

a thermally insulative material disposed between the heat sink and the body such that the heat sink is substantially only thermally coupled to the one or more thermoelectric devices.

18. The apparatus of claim 14, wherein the storage container comprises one or more ports configured to be coupled to conduits for providing the liquid or solid precursor to the storage container.

19. The apparatus of claim 14, wherein the one or more thermoelectric devices comprise at least two thermoelectric devices stacked atop one another to provide a thermal gradient across the body.