SUMMARY OF THE INVENTION

[0007] In an embodiment of the present invention, a tray assembly for controlling ambient temperature uniformity across a plurality of vessels is presented. The tray assembly comprises a main body made of a first material having a first thermal conductivity. The main body also has a plurality of openings configured to receive a plurality of vessels containing one or more nucleotide samples. The tray assembly further includes an adaptor made of a second material having a second thermal conductivity. The adaptor comprises a plurality of apertures aligned with the plurality of openings. Further, the thermal conductivity of the adaptor is greater than the thermal conductivity of the main body. The tray assembly yet further includes a seal which is locatable around the periphery of the adaptor and which is receivable by the main body.

[0008] In another embodiment, the main body of the tray assembly comprises an adaptation for receiving the seal.

[0009] In another embodiment, the at least one seal is selected from a group consisting of a top seal disposed between the main body and a thermal cover, one or more bottom seals disposed between the main body and a sample block, and a combination thereof.

[0010] In another embodiment, the first material has a thermal conductivity less than 2 W/(m-K) and the second material has a thermal conductivity greater than 200 W/(m-K).

[0011] In another embodiment, the first material comprises a polymer material and the second material comprises a metal.

[0012] In another embodiment, the first material comprises polycarbonate and the second material comprises a metal selected from the group consisting of aluminum, copper, and steel.

[0013] In another embodiment, the second material comprises copper.

[0014] In another embodiment, the second material comprises a stainless steel alloy.

[0015] In another embodiment, the adaptor comprises a plurality of openings corresponding to the plurality of openings of the main body.

[0016] In another embodiment, the adaptor comprises a plurality of thermally conductive elements.

[0017] In an embodiment of the present invention, a thermal cycler is provided. The thermal cycler comprises a tray assembly. The tray assembly comprises a main body made of a first

material having a first thermal conductivity and including a plurality of openings. The tray assembly further comprises an adaptor made of a second material having a thermal conductivity that is greater than the thermal conductivity of the first material. The adaptor comprises a plurality of apertures aligned with the plurality of openings. The tray assembly yet further comprises a seal which is locatable around the periphery of the adaptor and which is receivable by the main body. The thermal cycler also includes a control block configured to control the temperature of the one or more nucleotide samples. The thermal cycler further includes a thermal cover sized and positioned to at least partially cover the plurality of vessels. The thermal cycler further includes a sample block including one or more depressions configured to receive a plurality of vessels containing one or more nucleotide samples.

[0018] In another embodiment, the main body comprises an adaptation for receiving the seal.

[0019] In another embodiment, the adaptor is disposed between the main body and the one or more nucleotide samples.

[0020] In another embodiment, the thermal cover and tray assembly are configured to produce a plurality of temperature zones, when the plurality of vessels are located within the sample block during operation of the thermal cycler.

[0021] In another embodiment, the plurality of temperature zones within the vessels vary from one another within a predetermined temperature range.

[0022] In another embodiment, wherein the plurality of temperatures vary from one another by an amount that is less than or equal to 0.6 degrees Celsius.

[0023] In another embodiment, the plurality of temperatures vary from one another by an amount that is less than or equal to 0.5 degrees Celsius.

[0024] In another embodiment, the plurality of temperatures vary from one another by an amount that is less than or equal to 0.3 degrees Celsius.

[0025] In an embodiment of the present invention a method for nucleotide processing is provided. The process includes providing a sample block configured to receive a plurality of vessels containing one or more nucleotide samples. The process also includes providing a thermal cover configured to at least partially cover the plurality of vessels. The process further includes controlling the temperature of the one or more nucleotide samples by disposing a main body and adaptor between the thermal cover and the sample block. The main body and adaptor reduce evaporation and/or condensation across the plurality of vessels during nucleotide processing. The process yet further includes providing a seal which is locatable around the periphery of the adaptor and which is receivable by the main body. The main body comprises a plurality of openings and the adaptor comprises a plurality of apertures aligned with the plurality of openings.

What is claimed is:

1. A tray assembly for controlling ambient temperature uniformity across a plurality of vessels, comprising

a main body made of at least a first material having a first thermal conductivity and including a plurality of openings configured to receive a plurality of vessels containing one or more nucleotide samples;

an adaptor made of a second material having a thermal conductivity that is greater than the thermal conductivity of the first material, the adaptor comprising a plurality of apertures aligned with the plurality of openings; and

at least one seal which is locatable around the periphery of the adaptor and which is receivable by the main body.

2. The tray assembly of claim 1, wherein the main body comprises an adaptation for receiving the at least one seal.

3. The tray assembly of claim 2, wherein the at least one seal is selected from a group consisting of a top seal disposed between the main body and a thermal cover, one or more bottom seals disposed between the main body and a sample block, and a combination thereof.

4. The tray assembly of claim 1, wherein the first material has a thermal conductivity less than 2 W/(m-K) and the second material has a thermal conductivity greater than 200 W/(m-K).

5. The tray assembly of claim 1, wherein the first material comprises a polymer material and the second material comprises a metal.

6. The tray assembly of claim 1, wherein the first material comprises polycarbonate and the second material comprises a metal selected from the group consisting of aluminum, copper, and steel.

7. The tray assembly of claim 1, wherein the second material comprises copper.

8. The tray assembly of claim 1, wherein the second material comprises a stainless steel alloy.

9. The tray assembly of claim 1, wherein the adaptor comprises a plurality of thermally conductive elements.

10. A thermal cycler comprising

a tray assembly, comprising

a main body made of at least a first material having a first thermal conductivity and including a plurality of openings;

an adaptor made of a second material having a thermal conductivity that is greater than the thermal conductivity of the first material, the adaptor comprising a plurality of apertures aligned with the plurality of openings; and

at least one seal which is locatable around the periphery of the adaptor and which is receivable by the main body;

a sample block including one or more depressions configured to receive a plurality of vessels containing one or more nucleotide samples;

a control block configured to control the temperature of the one or more nucleotide samples; and

a thermal cover sized and positioned to at least partially cover the plurality of vessels.

11. The thermal cycler of claim 10, wherein the main body comprises an adaption for receiving the at least one seal.

12. The thermal cycler of claim 10, wherein the adaptor is disposed between the main body and the one or more nucleotide samples.

13. The thermal cycler of claim 10, wherein the thermal cover and tray assembly are configured to produce a plurality of temperature zones when the plurality of vessels are located within the sample block during operation of the thermal cycler.

14. The thermal cycler of claim 13, wherein the temperature zones within the vessels vary from one another within a predetermined temperature range.

15. The thermal cycler of claim 14, wherein the temperatures zones vary from one another by less than or equal to 0.6 degrees Celsius.

16. The thermal cycler of claim 14, wherein the temperatures zones vary from one another by less than or equal to 0.5 degrees Celsius.

17. The thermal cycler of claim 14, wherein the temperatures zones vary from one another by less than or equal to 0.3 degrees Celsius.

18. A method for nucleotide processing, comprising

providing a sample block configured to receive a plurality of vessels containing one or more nucleotide samples;

providing a thermal cover configured to at least partially cover the plurality of vessels;

controlling the temperature of the one or more nucleotide samples by disposing a main body and adaptor between the thermal cover and the sample block, the main body and adaptor reducing evaporation and/or condensation across the plurality of vessels during nucleotide processing; and

providing at least one seal which is locatable around the periphery of the adaptor and which is receivable by the main body,

wherein the main body comprises a plurality of openings and the adaptor comprises a plurality of apertures aligned with the plurality of openings.

19. The method of claim 18, wherein the controlling step further includes distributing ambient heat across the plurality of vessels during nucleotide processing.