CLAIMS

1. An incubator comprising:

an enclosure having an internal chamber configured to support a cell culture plate comprising a plurality of wells, wherein the enclosure comprises at least one passage configured for gas entry, a connector adapted to connect a pressurized gas source to the at least one passage, and a plurality of openings configured to allow access to the wells of the cell culture plate;

a controller configured to maintain a temperature of the internal chamber within a desired range;

a first heating/cooling device engaged directly or indirectly with the enclosure, the first heating/cooling device controlled by the controller; and

a sealing element comprising a first plurality of openings corresponding to at least a subset of the plurality of openings in the enclosure,

wherein the sealing element is configured to form a seal with the plurality of openings in the enclosure that allows the enclosure to maintain a pressure in the internal chamber between about 0.0005 psi to about 0.01000 psi above ambient pressure when gas from the pressurized gas source flows into the internal chamber,

wherein the sealing element is movable between a closed position where the sealing element occludes, and thereby seals, each of the plurality of openings in the enclosure and a first open position where the first plurality of openings of the sealing element are in register with the at least a subset of the plurality of openings in the enclosure, thereby providing access to the internal chamber of the enclosure and any cell culture plate contained therein, and

wherein the incubator is configured to maintain a selected internal temperature, humidity, and gas content within the internal chamber of the enclosure.

2. The incubator of claim 1, wherein each opening of the plurality of openings in the enclosure has a diameter of about 1 mm to about 10 mm, or about 1 mm to about 5 mm.

3. The incubator of claim 1, wherein the internal chamber has a volume of about $200\ cm^3$ to about $750\ cm^3$ or about $750\ cm^3$ to about $2000\ cm^3$.

4. The incubator of claim 1, wherein the cell culture plate is a 96-well plate or a 384-well plate.

5. The incubator of claim 1, wherein the plurality of openings in the enclosure are configured to be in register with the plurality of wells in the cell culture plate.

6. The incubator of claim 1, wherein the enclosure comprises a base and a lid, the base and the lid defining the internal chamber.

7. The incubator of claim 1, wherein the enclosure comprises a base, a lid, and a front plate, the base, the lid and the front plate defining the internal chamber.

8. The incubator of claim 6, wherein the base is formed from a rigid material having a high thermal conductivity and low thermal capacitance and is configured with a hollow region forming part or all of the internal chamber of the enclosure, and wherein the lid is formed from an insulating plastic.

9. The incubator of claim 7, wherein the base is formed from a rigid material having a high thermal conductivity and low thermal capacitance, wherein the base includes a bottom and four walls with one of the four walls having a height that is shorter than the height of the other three walls and is configured with a hollow region forming part or all of the internal chamber of the enclosure, and wherein the base is formed from a rigid material having a high thermal conductivity and low thermal capacitance.

10. The incubator of claim 6, wherein the lid includes one or more connectors configured to sealably connect the lid to the base, and wherein each of the one or more connectors are selected from the group consisting of a magnet, a flexible tab, and/or a clip.

11. The incubator of claim 7, wherein the lid includes one or more connectors configured to sealably connect the lid to the base, and wherein each of the one or more connectors are selected from the group consisting of a magnet, a flexible tab, and/or a clip.

12. The incubator of claim 1, wherein the sealing element is movable between a closed position, a first open position, and a second open position, and
wherein:

when the sealing element is in the closed position, each of the plurality of the openings in the enclosure are occluded;

when the sealing element is in the first open position, the first plurality of openings in the sealing element are in register with a first subset of the plurality of openings in the enclosure and all other openings of the plurality of openings in the enclosure are occluded; and

when the sealing element is in the second open position, the first plurality of openings in the sealing element are in register with a second subset of openings in the enclosure and all other openings of the plurality of openings in the enclosure are occluded.

13. The incubator of claim 12, wherein the first subset of openings in the enclosure and the second subset of openings in the enclosure are non-overlapping subsets.

14. The incubator of claim 1, wherein the sealing element is located inside the internal chamber of the enclosure.

15. The incubator of claim 12 further comprising: a sealing element actuator configured to move the sealing element between the first open position, the second open position, and the closed position.

16. The incubator of claim 20, wherein the enclosure includes a base and a lid, and wherein the sealing element is located between the PCB and the lid.

17. The incubator of claim 20, wherein each of the one or more sensors is selected from the group consisting of: a temperature sensor, a humidity sensor, an oxygen sensor, and a carbon dioxide sensor.

18. The incubator of claim 1, wherein the first heating/cooling device is selected from the group consisting of: a resistive heater, a fluid coil configured to circulate a heat exchange fluid, one or more Peltier devices, and combinations thereof.

19. The incubator of claim 1 further comprising: a second heating/cooling device, wherein the second heating/cooling device is within the enclosure and is controlled by the controller.

20. The incubator of claim 19, wherein the second heating/cooling device comprises a PCB having resistive heating elements and one or more sensors, and wherein the PCB comprises a plurality of openings in register with the plurality of openings passing through the enclosure.

21. The incubator of claim 1 further comprising: a support for the cell culture plate.

22. The incubator of claim 21, wherein the support is configured to slideably move relative to the enclosure from a position within the enclosure to a position outside of the internal chamber of the enclosure.

23. The incubator of claim 21 further comprising: an access door engaged with the support for the cell culture plate, wherein the support and access door form an access assembly including a front plate that sealably interfaces with a portion of the enclosure.

24. The incubator of claim 23 further comprising: a biased connection between the front plate and the access door configured to provide a compressive force to the front plate.

25. The incubator of claim 23 further comprising: an enclosure support configured to support the enclosure, wherein the access assembly is movably mounted on the enclosure support.

26. The incubator of claim 25, wherein:
the enclosure support comprises tracks;
the access assembly comprises rails configured to slide relative to the tracks on the enclosure support, the rails having an engagement surface configured to engage with a complementary structure of the enclosure support to secure a position of the access assembly relative to the enclosure support, and

the secured position of the access assembly corresponds to an open or closed position of the access assembly.

27. The incubator of claim 21, wherein the support is formed by one or more internal surfaces of the enclosure.

28. The incubator of claim 1, wherein the controller is further configured to maintain the humidity and gas content within the internal chamber of the enclosure.

29. The incubator of claim 1, wherein each of the plurality of openings in the sealing element has a diameter of about 1 mm to about 10 mm, or about 1 mm to about 5mm.

30. A method for accessing an internal chamber of an incubator, wherein
the incubator comprises an enclosure having a plurality of openings and a sealing element having a plurality of openings corresponding to at least a subset of the plurality of openings in the enclosure, the method comprising:

moving the sealing element to an open position, thereby bringing the plurality of openings in the sealing element into register with a first subset of openings of the plurality of openings in the enclosure, the plurality of openings in the sealing element and the first subset of openings of the plurality of openings in the enclosure thereby providing a first plurality of passages from an exterior of the incubator to an internal chamber of the enclosure;

advancing an import/export tip through one or more of the plurality of passages between the exterior of the incubator and the internal chamber of the enclosure;

collecting or depositing a material within the internal chamber of the enclosure via the import/export tip;

withdrawing the import/export tip through one or more of the passages between the exterior of the incubator and the internal chamber of the enclosure after collecting or depositing the material; and

moving the sealing element to a closed position such that the sealing element occludes the plurality of openings in the enclosure,

wherein the sealing element is in the open position for an amount of time which is sufficiently short so as to prevent a carbon dioxide content and/or a humidity of air present in the internal chamber of the incubator from equilibrating with a carbon dioxide content and/or a humidity of air surrounding the incubator.

31. The method of claim 30, wherein collecting or depositing the material comprises collecting or depositing the material within a well of a cell culture plate within the internal chamber of the enclosure.

32. A method for accessing an internal chamber of an incubator, wherein the incubator comprises an enclosure having a plurality of openings and a sealing element having more than one plurality of openings, wherein each plurality of openings in the sealing element corresponds to at least a subset of the plurality of openings in the enclosure, the method comprising:

moving the sealing element to a first open position and thereby bringing a first plurality of openings in the sealing element into register with a first subset of the plurality of openings in the enclosure, the first plurality of openings in the sealing element and the first subset of openings in the plurality of openings in the enclosure providing, when in register, a first plurality of passages from an exterior of the incubator to the internal chamber of the enclosure;

advancing an import/export tip through one or more of the first plurality of passages between the exterior of the incubator and the internal chamber of the enclosure; and collecting or depositing a material with the import/export tip within the internal chamber of the enclosure.

33. A system for incubation, comprising:

the incubator of claim 1;

a robotic sampling component configured to access the incubator to collect or deposit samples within an internal chamber of an enclosure of the incubator; and

at least one controller configured to:

open a plurality of passages from an exterior of the incubator to the internal chamber of the enclosure; and

control the robotic sampling component to access, via the plurality of passages, a plurality of wells of a well plate contained within the internal chamber of the enclosure.