a substrate attached to the base, the substrate comprising a plurality of reaction regions configured to receive one or more biological samples; and

a cover comprising an inner surface, the cover configured to be attached to the base ~~such that the base and cover together provide a cavity containing the substrate~~; and

wherein the inner surface includes a central area and a recessed area disposed about the central area, the central area configured to cover the reaction regions, the recessed area being offset from the central area in a direction normal to the inner surface;

wherein during use the base, the central area, and the recessed area together provide a cavity containing the substrate;

wherein the recessed area comprises a trough disposed along a perimeter of the central area, the trough comprising a bottom that is offset from the central area in a direction normal to the inner surface; and

wherein the bottom surface has a depth that varies along the perimeter.

According to a second aspect of the present invention, there is provided an instrument for biological analysis, comprising:

~~a base configured to receive a sample carrier as defined in the first aspect;~~

a carrier configured to be received within the instrument and to contain a plurality of cases as defined in the first aspect;

an electromagnetic radiation source configured to produce one or more excitation beams;

an excitation optical system configured to direct the one or more excitation beams to the biological samples;

an optical sensor configured to receive an emission from the biological samples in response to the one or more excitation beams;

an emission optical system configured to direct the emission from at least some of the biological samples to the optical sensor;.

~~According to third aspect of the present invention, t~~There is ~~provided~~ also disclosed a method comprising:

providing a base and a substrate comprising a plurality of reaction regions, wherein the substrate is attached to the base;

loading one or more biological samples into at least some of the reaction regions;

enclosing substrate within a cavity by locating a cover over base;

filling the cavity with a fluid via the fill port;

providing a plug assembly comprising a plug and a plug driver;

attaching the plug assembly to the fill port by applying a first force or torque; and

applying a second force or torque to fracture plug assembly and detach the plug driver from plug.

~~According to a fourth aspect of the present invention, t~~There is ~~provided~~ also disclosed a case for containing a plurality of biological samples, the case comprising:

a base comprising a fill port;

a substrate attached to the base, the substrate comprising a plurality of reaction regions configured to receive one or more biological samples; and

a plug assembly comprising a plug and a plug driver, the plug assembly configured to close the fill port during use;

wherein the plug assembly is configured to close the fill port using a first force or torque and to separate the plug driver from the plug using a second force or torque that is higher than the first force and/or that is in a different direction than the first force or torque.

Brief Description of the Drawings

Embodiments of the present invention may be better understood from the following detailed description when read in conjunction with the accompanying drawings. Such embodiments, which are for illustrative purposes only, depict novel and non-obvious aspects of the invention. The drawings include the following figures:

WHAT IS CLAIMED IS:

1. A case for containing a plurality of biological samples, the case comprising:

a base;

a substrate attached to the base, the substrate comprising a plurality of reaction regions configured to receive one or more biological samples; and

a cover comprising an inner surface, the cover configured to be attached to the ~~base such that the base and cover together provide a cavity containing the substrate~~; and

wherein the inner surface includes a central area and a recessed area disposed about the central area, the central area configured to cover the reaction regions, the recessed area being offset from the central area in a direction normal to the inner surface;

wherein during use the base, the central area, and the recessed area together provide a cavity containing the substrate;

wherein the recessed area comprises a trough disposed along a perimeter of the central area, the trough comprising a bottom that is offset from the central area in a direction normal to the inner surface; and

wherein the bottom surface has a depth that varies along the perimeter.

2. The case of claim 1, wherein the central area is transparent to provide optical access to the plurality of reaction regions.

3. The case of claim 1, wherein the substrate comprises a first surface and an opposing second surface, and the plurality of reaction regions comprises a plurality of through-holes disposed between the surfaces, the through-holes configured to receive one or more biological samples.

4. The case of claim ~~1~~3, further comprising a fluid, wherein the cover is attached to the base and the fluid is in contact with the first surface, the second surfaces, and an inner surface of the cover.

5. The case of claim 1, wherein the recessed area is configured to receive gas from the central area that is released by a fluid in the cavity when the cover is attached to the base.

6. The case of claim 1, wherein the base comprises a plurality of support pads disposed about a periphery of a bottom surface of the base, wherein support pads maintain the substrate over the bottom surface of the base.

7. The case of claim 6, wherein the substrate is maintained by a contact force between the substrate and one or more of the support pads.

8. The case of claim 6, wherein support pads comprise a first group of support pads and a second group of support pads distinct from the first group of support pads, wherein the substrate is held by a contact force between the substrate and the first group of the support

pads and a spacing between the substrate and the bottom surface is maintained by the second group of support pads.

9. The case of claim ~~1~~5, wherein the received gas comprises a plurality of air bubbles.

10. The case of claim 1, wherein the recessed area comprises a rim disposed about the trough, the rim being offset below the central area in a direction normal to the inner surface, the trough being offset below the rim in a direction normal to the inner surface.

~~10~~11. An instrument for biological analysis, comprising:

~~a base configured to receive a sample carrier according to anyone of claims 1-7;~~

a carrier configured to be received within the instrument and to contain a plurality of cases according to claim 1;

an electromagnetic radiation source configured to produce one or more excitation beams;

an excitation optical system configured to direct the one or more excitation beams to the biological samples;

an optical sensor configured to receive an emission from the biological samples in response to the one or more excitation beams; and

an emission optical system configured to direct the emission from at least some of the biological samples to the optical sensor.

12. The instrument according to claim 11, further comprising a second carrier that is not configured to receive a case according to claim 1.

13. The instrument according to claim 12, wherein the second carrier is configured to receive a microtiter plate containing 384 sample wells.

~~11. A method comprising:~~

~~providing a base and a substrate comprising a plurality of reaction regions, wherein the substrate is attached to the base;~~

~~loading one or more biological samples into at least some of the reaction regions;~~

~~enclosing substrate within a cavity by locating a cover over base;~~

~~filling the cavity with a fluid via the fill port;~~

providing a plug assembly comprising a plug and a plug driver;

attaching the plug assembly to the fill port by applying a first force or torque; and

applying a second force or torque to fracture plug assembly and detach the plug driver from plug.

12. The method of claim 11, further comprising:

mounting the base, the sample holder, and the cover into instrument; and

operating the instrument to monitor a biological reaction in one or more of the through-holes.

13. The case of claim 11, wherein the substrate comprises a first surface and an opposing second surface, and the plurality of reaction regions comprises a plurality of through-holes

~~disposed between the surfaces, the through-holes configured to receive one or more biological samples~~

~~14. The method of claim 11, wherein the cover comprises an inner surface in contact with the fluid, the inner surface including a central area disposed over the plurality of through-holes and a recessed area offset from the central area in a direction normal to the inner surface.~~

~~15. The method of claim 14, further comprising introducing a gas into the cavity, wherein the gas is substantially confined within the recessed area.~~

~~16. The method of claim 15, wherein the gas comprises a plurality of air bubbles.~~

~~17. The method of claim 15, wherein introducing a gas into the cavity occurs simultaneously with filling the cavity.~~

~~18. A case for containing a plurality of biological samples, the case comprising:~~

~~a base comprising a fill port;~~

~~a substrate attached to the base, the substrate comprising a plurality of reaction regions configured to receive one or more biological samples; and~~

~~a plug assembly comprising a plug and a plug driver, the plug assembly configured to close the fill port during use;~~

~~wherein the plug assembly is configured to close the fill port using a first force or torque and to separate the plug driver from the plug using a second force or torque that is higher than the first force and/or that is in a different direction than the first force or torque.~~