

Systems and Methods for Biological Analysis

Background of the Invention

Field of the Invention

The present invention relates generally to systems, devices, and methods for observing, testing, and/or analyzing one or more biological samples, and more specifically to systems, devices, and methods for observing, testing, and/or analyzing an array of biological samples.

Description of the Related Art

Systems for biological and biochemical reactions have been used to monitor, measure, and/or analyze such reactions in real time and during post-run or end-point analysis. Such systems may include an optical reader, commonly used in sequencing, genotyping, polymerase chain reaction (PCR), and other biochemical reactions to monitor the progress and provide quantitative data. For example, an optical excitation beam may be used in real-time PCR (qPCR) reactions to illuminate hybridization probes or molecular beacons to provide fluorescent signals indicative of the amount of a target gene or other nucleotide sequence. In addition, an end-point optical reader may be used to provide data after reactions have completed, such as for digital PCR (dPCR) analysis. Increasing demands to provide greater numbers of reactions per test or experiment have resulted in instruments that are able to conduct ever higher numbers of reactions simultaneously.

The increase in the number sample sites in an assay, test, or experiment has led to microtiter plates and other sample formats that provide ever smaller sample volumes. In addition, techniques such as dPCR have increased the demand for smaller sample volumes that contain either zero or one target nucleotide sequence in all or the majority of a large number of test samples. There is a need for systems and sample formats that will provide reliable data in a high-density sample format.

Summary

One aspect relates to a case for containing a plurality of biological samples, the case comprising: a base; a substrate attachable to the base, the substrate comprising a plurality of reaction regions disposed along a first surface of the substrate, the reaction regions being configured to receive one or more biological samples; and a cover comprising a downward facing surface, the cover configured to be attached to the base such that the base and cover together provide a cavity containing the substrate, the cover configured during use so that the

downward facing surface of the cover is parallel or approximately parallel to the first surface of the substrate; a fill port disposed along the inner surface of the cover, the fill port configured for at least partially filling the cavity when the cover is attached to the base.

Another aspect relates to a case for containing a plurality of biological samples, the case comprising: a base; a substrate attachable to the base, the substrate comprising a plurality of reaction regions disposed along a first surface of the substrate, the reaction regions being configured to receive one or more biological samples; and a cover comprising a downward facing surface, the cover configured to be attached to the base such that the base and cover together provide a cavity containing the substrate, the cover configured during use so that the downward facing surface of the cover is parallel or approximately parallel to the first surface of the substrate; a plurality of tabs located on an upward facing surface of the base, wherein the substrate is attached to the base.

Another aspect relates to a method, comprising: providing the components of a case for containing a plurality of biological samples, the case comprising: a base; a substrate comprising a plurality of reaction regions disposed along a first surface; and a cover comprising a downward facing surface and a fill port disposed along the inner surface; loading at least some of the reaction regions with one or more biological samples; subsequent to loading, attaching the cover to the base to form a cavity containing the substrate, such that the downward facing surface of the cover is parallel or approximately parallel to the first surface of the substrate at least partially filling the cavity with a fluid such that the fluid covers the first surface of the substrate by physical contact between at least some of the tabs and the substrate.

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:

FIG. 1 is a system for processing a plurality of biological samples according to embodiments of the present invention.