

[0041] In another aspect, the present disclosure provides a device. The device may comprise a plurality of chambers configured to contain one or more samples. The device may comprise a plurality of elements disposed adjacent to the plurality of chambers. The plurality of elements may be configured to affect at least one condition within each chamber of the plurality of chambers. The device may comprise at least one additional element disposed adjacent to one or more elements of said plurality of elements. The additional element may be configured to affect at least one condition on the plurality of elements. The device may comprise at least one optical system configured to measure a presence or absence of a signal from each chamber of the plurality of chambers.

[0042] The device may comprise at least about 1, 2, 3, 4, 5, 10, 25, 50, 75, 96, 100, 150, 200, 250, 300, 350, 384, 400, 450, 500, or more chambers. The device may comprise at most about 500, 450, 400, 384, 350, 300, 250, 200, 150, 100, 96, 75, 50, 25, 10, 5, 4, 3, 2, or fewer chambers. The device may comprise a number of chambers as defined by any two of the preceding values. A chamber may be configured to contain a volume of at least about 0.1, 0.5, 1, 5, 10, 50, 100, 500, 1,000, 5,000, 10,000, or more microliters. A chamber may be configured to contain a volume of at most about 10,000, 5,000, 1,000, 500, 100, 50, 10, 5, 1, 0.5, 0.1, or less microliters. Each chamber of the plurality of chambers may be of a same size. For example, an array of 96 chambers each with the same volume can be used. The chambers of the plurality of chambers may be different sizes. For example, a device can comprise a plurality of smaller chambers and a plurality of larger chambers. The plurality of chambers may in a 1-dimensional, 2-dimensional, or 3-dimensional array. For example, the plurality of chambers may be configured similar to a 2-dimensional 96 well plate. In some cases, the plurality of chambers can be organized in a strip. For example, a substrate as described elsewhere herein can be a strip. The plurality of chambers may be configured as a series of individual tubes. In some cases, the chamber is at least a portion of a flow cell. For example, a flow cell can be configured such that a portion of the flow cell is adjacent to the element as described elsewhere herein. The chamber may be at least a portion of a chip. For example, a chip can comprise a plurality of chambers.

[0043] The plurality of chambers may be configured to each contain at least about 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or more samples. For example, a single chamber can be configured with dividers to contain 2 samples within the chamber. The plurality of chambers may be configured to each contain at most about 10, 9, 8, 7, 6, 5, 4, 3, 2, or 1 sample. The plurality of chambers may be collectively configured to contain at least about 1, 5, 10, 25, 50, 75, 100, or more samples. For example, an array of 96 chambers can be configured to contain 96 samples. The plurality of chambers may be collectively configured to contain at most about 100, 75, 50, 25, 10, 5, or less

samples. Each chamber of the plurality of chambers may be configured to contain a different sample.

[0044] A chamber may be in the form of a well. For example, the chamber can be a cylinder with one open and one closed end. A chamber may comprise one or more of polymers (e.g., plastics, polyethylene, polytetrafluoroethylene, etc.), metals (e.g., pure metals, alloys, etc.), oxides (e.g., glasses, insulative oxides, etc.), semiconductors (e.g., silicon, etc.), or the like, or any combination thereof. A chamber may be configured to not react with a material (e.g., a sample, a reagent, etc.) deposited within the chamber. For example, an iron chamber can be lined with stainless steel to reduce a reaction with a water solvent. In another example, a polyethylene chamber can be lined with polytetrafluoroethylene to protect the chamber for harsh reagents.

[0045] The device may comprise a plurality of elements disposed adjacent to the plurality of chambers. The plurality of elements may be in contact with the plurality of chambers. The plurality of elements may be in thermal contact with the plurality of chambers. For example, the plurality of elements can be connected to the plurality of chambers via a plurality of thermal transfer pads.

[0046] The plurality of elements may be configured to affect at least one condition within each chamber of the plurality of chambers. The at least one condition may be a temperature, a magnetic field, an optical condition, or the like, or any combination thereof. The condition may be a condition of an individual chamber. For example, the temperature of a first chamber can be held at a different temperature from a second chamber. Each chamber of the plurality of chambers may be maintained at a temperature of at least about 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or more degrees Celsius from a set temperature for each chamber. Each chamber of the plurality of chambers may be maintained at a temperature of at most about 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, 0.9, 0.8, 0.7, 0.6, 0.5, 0.4, 0.3, 0.2, 0.1, or less degrees Celsius from a set temperature for each chamber. Each chamber of the plurality of chambers may be maintained at a temperature range as defined by any two of the preceding values. For example, each chamber can be maintained at a temperature in a range from 0.5 to 1 degree Celsius from a set point of each chamber. Each set point may be the same for each chamber. For example, all chambers can be maintained at 50 degrees Celsius. Different chambers may have different set points. For example, a first set of chambers can be maintained at 95 degrees Celsius while a second set of chambers can be maintained at -15 degrees Celsius. The device may be configured to temperature cycle a first subset of the plurality of chambers while maintaining a second subset of the plurality of chambers at a constant temperature. For example, a PCR reaction can be performed in a plurality of chambers. In this example, once a fluorescence signal

Nanoparticle-Assisted PCR (nanoPCR), Nested PCR, Overlap-extension PCR, Splicing by overlap extension (SOEing), PAN-AC, quantitative PCR, real-time Quantitative PCR, Reverse Complement PCR, Reverse Transcription PCR (RT-PCR), Rapid Amplification of cDNA Ends, RNase H-dependent PCR, Single Specific Primer-PCR, Solid Phase PCR, Suicide PCR, Thermal asymmetric interlaced PCR (TAIL-PCR), Touchdown PCR, Step-down PCR, Universal Fast Walking, or the like. The signal may comprise an optical signal, an electrical signal, a physical signal, or the like, or any combination thereof. The optical signal may comprise an absorption signal (e.g., an absorption intensity, an absorption peak wavelength), a fluorescence signal (e.g., a fluorescence intensity, a fluorescence wavelength, a fluorescence lifetime), a plasmonic property, or the like, or any combination thereof. The electrical signal may comprise resistance, impedance, capacitance, or the like, a change thereof, or any combination thereof. The physical signal may comprise a physical state of the sample. For example, a physical signal can be a melting point of the sample.

[0056] The method 100 may comprise using a second element operably coupled to the first element to adjust an operating condition of the first element at least partially in response to the signal or signal change, to thereby affect the condition in the location (130). Since the signal can be dependent on the amount of analyte within the sample, the device can use the amount of signal as a proxy for how far the reaction has progressed. As such, instead of using an arbitrary number of cycles to determine the reaction progress, the signal can instead be used as a quantitative measure. The monitoring may comprise real-time monitoring (e.g., reading the signal in real-time as the reaction progresses), fixed-interval monitoring (e.g., reading the signal at predetermined times), or the like, or any combination thereof. The method 100 may comprise adjusting the operating condition of the first element to stop the PCR reaction upon said signal or signal change reaching a predetermined threshold (140). For example, once a predetermined amount of fluorescent signal is generated in a chamber, the PCR reaction can be stopped by reducing the temperature. Examples of operating conditions include, but are not limited to, temperature, agitation (e.g., stirring, shaking, etc.), presence or absence of light, presence or absence of chemical compounds (e.g., additional reagents, gasses, etc.), or the like, or any combination thereof. For example, an operating condition can be a temperature of the reaction, and a change in the operating condition can be a change in the temperature. In another example, an operating condition can be a presence of light energy, and the change in the operating condition can be turning off the light.

[0057] A second chamber of the device may comprise a second sample. For example, the first chamber can contain a sample from a first subject, and the second chamber can comprise a