

a sample collection head extraction location at or near the terminus of the cavity and the barb is positioned in the cavity so as to retain the collection head in the extraction location. The retention feature may be a shelf, wherein the shelf is a stepped discontinuity in an internal surface of the sample chamber. The sample chamber may be curved and the radius of curvature of the internal surface, as a function of increasing depth in the elongated cavity, steps from a first value to a second higher value at the discontinuity. In one embodiment, the shelf is positioned in the cavity so as to engage a shaft fragment linked to the head after the shaft fractures and to retain the collection head in the extraction location. In this embodiment, the shelf may be configured to retain a swab head contacted with the shelf within the extraction location.

[0011] The invention also provides a method of using an assay cartridge with a sample chamber configured as described above. This method includes the steps of (a) inserting the applicator stick into the sample chamber; (b) fracturing the shaft of the applicator stick into a head fragment linked to the sample collection head and a handle fragment that has been separated from the sample collection head; and (c) removing the handle fragment. In this method the sample collection head retention feature(s) engage the sample collection head and retain the head during removal of the handle fragment.

[0012] The assay cartridge described above may include an integrated filter element in the second region, and the assay cartridge further comprises an extraction buffer chamber connected to an extraction buffer vent port and an extraction buffer conduit connected to the sample chamber, wherein the sample chamber is connected to a collection chamber via a sample chamber conduit. The extraction buffer conduit may comprise a Z-transition. In one embodiment, the sample chamber comprises a sample introduction port and the first region is proximate to the sample introduction port and the second region is distal to the sample introduction port. The sample chamber may also include an internal terminus and the integrated filter element is positioned at or near the terminus. Still further, the extraction buffer conduit may be positioned at or near the internal terminus of the sample chamber, e.g., within about 1 to 2 centimeters of the sample chamber base.

[0013] In one embodiment, the collection component of the assay cartridge may include a collection chamber and a sensing chamber, wherein the collection chamber is connected to (i) an input conduit connected to the top of the collection chamber, wherein the input conduit is positioned proximal to a wall of the collection chamber; (ii) an output conduit connected to the bottom of the collection chamber; and (iii) a sensing conduit comprising a tube that extends down from the top of the collection chamber to a pre-defined height in the collection chamber, wherein the sensing chamber connects to the sensing conduit at the top of the sensing chamber and proximal to a wall of the sensing chamber and to a sensing chamber vent. The collection component may further comprise (a) a baffle positioned at the top of the collection chamber and adjacent to the input conduit, and/or (b) an optical sensor adapted to detect the presence of liquid in the sensing chamber.

[0014] The assay cartridge described herein may be adapted to perform any number of assays for an analyte of interest. In one embodiment, the cartridge is configured to conduct influenza assays. In this embodiment, the assay cartridge includes a first detection chamber and a second detec-

tion chamber. The first detection chamber includes a first set of assay reagents and the second detection chamber includes a second set of assay reagents. The first and second detection chambers may be configured to conduct duplicate or different measurements of an analyte of interest. In one embodiment, the first set of assay reagents are configured to conduct a first measurement of a first analyte and the second set of assay reagents are configured to conduct a second measurement of a second analyte. The first detection chamber may be configured for detection and typing of influenza virus. In this embodiment, the first set of assay reagents comprise an antibody directed to a target selected from the group consisting of influenza A nucleoprotein, influenza B nucleoprotein, and combinations thereof, and optionally, the first set of assay reagents further comprise an element selected from the group consisting of a positive control, a negative control, and combinations thereof. Still further, the first set of assay reagents may further include an antibody directed to an additional target selected from the group consisting of influenza C, adenovirus, parainfluenza, human metapneumovirus, and combinations thereof. The second set of assay reagents may include antibodies directed to at least two different hemagglutinin (HA) antigen subtypes. The different HA antigen subtypes may be selected from the group consisting of H1, H3, H1 from swine origin influenza virus (SOIV), atypical hemagglutinin subtype, pandemic hemagglutinin subtype, H2, H5, H7, H9, and combinations thereof. In one specific embodiment, the first detection chamber includes a first plurality of working electrodes having the first set of assay reagents immobilized thereon, the first plurality of working electrodes being arranged in a first one-dimensional array within the first detection chamber; and (ii) the second detection chamber comprises a second plurality of working electrodes having the second set of assay reagents immobilized thereon, the second plurality of working electrodes being arranged in a second one-dimensional array within the second detection chamber. The assay cartridge may also include an additional component selected from the group consisting of an extraction buffer chamber, a wash buffer chamber, and combinations thereof. In one embodiment, the extraction buffer is acidic, e.g., the extraction buffer comprises a buffering agent selected from the group consisting of carboxylic acids, polycarboxylic acids, quaternary ammonium buffers, and combinations thereof. The buffering agent may include a carboxylic acid selected from the group consisting of acetic acid, lactic acid, and combinations thereof. In one embodiment, the buffering agent comprises polycarboxylic acid selected from the group consisting of citric acid, glutaric acid and combinations thereof. The extraction buffer may also comprise an additional agent selected from the group consisting of anti-foam agent, a surfactant, and combinations thereof, e.g., an anti-foam agent selected from the group consisting of SE-15, Antifoam 204, Antifoam A, Antifoam B, Antifoam C, Antifoam Y-30, and combinations thereof, a non-ionic surfactant selected from the group consisting of Tween 20, Thesit, Triton X-100 and combinations thereof; and/or an ionic surfactant selected from deoxycholic acid, CHAPS and combinations thereof.

[0015] The invention also contemplates a kit including an assay cartridge as described herein. Such a kit may also include an applicator stick. The applicator stick may include a shaft segment and a head segment, wherein the shaft segment comprises a weak point configured to break the applicator stick at the weak point upon application of a force upon