

[0278] The two piece cartridge design also advantageously simplifies the employment of additional anti-foaming measures in the waste chambers. A vertical web, or partial wall, can be included in the upper portions of the waste chambers 1610, 1611 located in the upper cartridge component 1600, another embodiment of upper cartridge component 1411. Preferably the anti-foaming web is arranged between the waste chamber vent and the waste chamber input. The height of the anti-foaming web preferably extends the full depth of the upper portion of the waste chamber but may be less than the full depth as well. Alternatively, the anti-foaming web can extend beyond the depth of the upper portion of the waste chamber so that it protrudes into the lower portion of the waste chamber. Preferably the height of the anti-foaming web is selected to achieve optimum anti-foaming.

[0279] As discussed above, the input conduits of the waste chambers are preferably arranged so as to enter the waste chambers in a manner that allows the waste fluid to run down the wall of the waste chamber to minimize or eliminate foaming. As illustrated in FIG. 16a, the input conduits 1615, 1616 intersect one of the walls of the waste chambers. Additionally, the vents are configured and arranged to access the waste chambers at a point that will be above the anticipated fluid level. Locating the waste chamber vents at or near the top of the waste chamber also helps to ensure that any foaming that may occur within the chamber does not result in fluid entering the vent line and possibly contaminating the cartridge reader instrument.

[0280] FIG. 32 shows a schematic of the fluidic network of cartridge 3200, a preferred embodiment of the invention configured to extract analyte from a matrix, preferably from an applicator stick, most preferably from a swab. FIG. 33 shows an exploded view of a preferred design of cartridge 3200. Cartridge 3200 illustrates two preferred features of cartridges of the invention: a sample chamber for extracting analyte from a matrix and the use of a "reverse flow" wash. Cartridge 3200 has reagent chamber 3210 linked to vent port 3212 and extraction reagent conduit 3214 (preferably, comprising a Z-transition). Reagent chamber 3210 holds a liquid reagent suitable for extracting the analyte. Preferably, reagent chamber holds an ampoule of nitrous acid or, more preferably, an ampoule of an acid (preferably, acetic acid) and a dry nitrate salt outside of the ampoule so that rupturing the ampoule leads to the formation of nitrous acid. Nitrous acid is a particularly useful extraction reagent for extracting cell wall antigens from gram positive bacteria and may also be used to extract markers from other organisms in mucus containing samples such as upper respiratory samples (see, e.g., the extraction methods and reagents disclosed in U.S. Provisional Patent Application 60/436,591, filed Dec. 26, 2002, entitled Methods Compositions and Kits for Biomarker Extraction, hereby incorporated by reference).

[0281] Cartridge 3200 has an elongated sample chamber 3220 (a sample chamber configured for extracting samples such as those described above in connection with FIGS. 28-30) connected to extraction reagent conduit 3214 and sample conduit 3224 so as to allow the flow of extraction reagent through the sample (preferably, through swab head 3205). Preferably, as shown in FIG. 33, sample chamber 3220 is angled or curved along its elongated dimension so as to aid in breaking a scored swab inserted into the sample compartment. Sample conduit 3224 is connected to bubble trap 3226 (preferably connected to bubble trap vent port 3266) for removing air from the extracted sample and waste chamber

3228 (which is preferably connected to waste vent port 3262). Further downstream, sample conduit 3224 is connected to detection chamber 3230. Sample conduit 3224 comprises pill zone 3225 which may hold labeled binding reagents (e.g., labeled antibodies for use as detection reagents in sandwich immunoassays) and/or a neutralization reagent (e.g., a pH buffering component such as Tris, Hepes, phosphate and the like) for neutralizing an acidic extraction reagent in the sample (such as nitrous acid).

[0282] Detection chamber 3230, preferably, comprises immobilized binding reagents for analytes of interest, preferably an array of binding reagents, preferably an array of binding reagents supported on electrode arrays for conducting ECL measurements as described for other cartridge embodiments above. In an especially preferred embodiment the binding reagents are antibodies directed against markers of organisms (preferably including at least one gram positive bacteria, most preferably a *Streptococcus* species) that may be found in mucus-containing sample such as upper respiratory samples (see, e.g., the organisms described in U.S. Provisional Patent Application 60/436,591, filed Dec. 26, 2002, entitled Methods Compositions and Kits for Biomarker Extraction, hereby incorporated by reference). Detection chamber 3230 is connected to wash reagent chamber 3240 via wash reagent conduit 3242 (which, preferably, comprises a Z-transition). Vent port 3244 is arranged along wash reagent conduit 3242 between detection chamber 3230 and wash reagent chamber 3240. Wash reagent chamber 3240 is also connected to vent port 3241. Wash reagent chamber 3240 comprises a liquid wash reagent, preferably in an ampoule. The liquid wash reagent, preferably, comprises an ECL coreactant and provides an appropriate chemical environment for an ECL measurement.

[0283] The fluidic arrangement of cartridge 3200 allows for forward flow of extracted sample through pill zone 3225 into detection chamber 3230 and reverse flow of sample into waste chamber 3228 and wash reagent from wash reagent chamber 3240 into detection chamber 3230.

[0284] Cartridge 3200 also has optional control detection chamber 3250 which is preferably configured like detection chamber 3230. The fluidic arrangement of the cartridge allows wash reagent from wash reagent chamber 3240 to pass through pill zone 3252 to detection chamber 3250. Pill zone 3252, preferably, comprises the same binding reagents as pill zone 3225 but also comprises control reagents (preferably, predetermined amount of the analytes measured in detection chamber 3230) so that reconstitution with wash reagent forms a control sample. The fluidic arrangement further allows the forward flow of control sample into waste chamber 3254 (which is preferably connected to waste vent port 3264) and wash reagent from wash reagent chamber 3240 into detection chamber 3250.

[0285] FIG. 37 shows a schematic of the fluidic network of cartridge 3700, an alternate embodiment of a cartridge configured to extract analyte from a matrix, preferably from an applicator stick, most preferably from a swab. Unlike cartridge 3200, cartridge 3700 is designed to split the extracted sample between two detection chambers. Cartridge 3700 also illustrates certain alternative approaches to fluidic features in a fluidic network including an alternative approach to collecting and removing bubbles from an extracted sample. Cartridge 3700 has an extraction buffer chamber 3710 linked to an extraction buffer vent port and, through an integrated filter element, to an extraction buffer conduit (preferably, compris-