sample conduit connected to the sample chamber may comprise a filter. Still further, the cartridge may have a bubble trap chamber connected to the sample chamber and the method may further include the step of introducing the sample liquid into the bubble trap and removing bubbles from the sample liquid prior to introducing the sample liquid into the detection chamber.

[0048] In certain embodiments the bubble trap chamber may connect to the sample chamber via a bubble trap conduit that is connected to the sample conduit wherein the bubble trap conduit is connected to the bubble trap chamber at or near the bottom of the bubble trap chamber. In such an embodiment, the step of removing bubbles may comprise maintaining the sample liquid in the bubble trap for a sufficient amount of time to allow any bubbles that might be present in the sample liquid to rise to the top of the sample liquid allowing a reduced bubble portion of the sample liquid to then be removed from the bubble trap chamber through the bubble trap chamber conduit. Alternatively, the bubble trap chamber may be interposed between the sample conduit and the detection chamber and may have an inlet connected to the sample conduit and an outlet connected to the detection chamber wherein the outlet is arranged at or near the bottom of the bubble trap chamber. In such an alternative embodiment, the step of removing bubbles may comprise maintaining the sample liquid in the bubble trap for a sufficient amount of time to allow any bubbles that might be present in the sample liquid to rise to the top of the sample liquid allowing a reduced bubble portion of the sample liquid to be removed from the bubble trap chamber through the bubble trap chamber conduit.

[0049] In accordance with yet another aspect invention, an assay system may comprise an assay cartridge in accordance with any of the embodiments of the present invention and a cartridge reader adapted to carry out an assay using the cartridge.

[0050] Additionally, a kit is disclosed that may comprise an assay cartridge in accordance with any of the embodiments of the present invention and an applicator stick. The applicator stick of such a kit may have a predefined weak point.

[0051] The invention also relates to cartridge readers adapted to control and carryout measurements using the above described cartridges, systems comprising the above described cartridges and a cartridge reader and kits including the cartridge and one or more reagents and/or applicator sticks used in assays carried out employing the cartridges.

BRIEF DESCRIPTION OF THE DRAWINGS

[0052] **FIG. 1***a* depicts a simplified pictorial representation of a cartridge-based assay module.

[0053] **FIG. 1***b* depicts one embodiment of an assay cartridge having two detection chambers and two banks of individually addressable electrodes.

[0054] **FIG. 1***c* illustrates an exploded assembly of one embodiment of an electrode array.

[0055] **FIG. 2** is a pictorial representation of an electrode array having matched electrical lead resistances.

[0056] **FIGS. 3***a*-**3***e* illustrate various configurations of an electrodes array for use with a pair-wise firing schemes.

[0057] **FIGS. 3***f*-**3***g* illustrate two possible configurations of an electrode array employing a single, common counter electrode.

[0058] **FIG. 4** depicts the electrode array of **FIG. 3***a* in one embodiment of an assay cartridge.

[0059] **FIG. 5** is an image of electrochemiluminescence emitted from an electrode array where one of the electrodes has an air bubble on the electrode surface.

[0060] **FIGS. 6***a* and **6***b* are images of electrochemiluminescence from electrode arrays that are untreated (**FIG. 6***a*) or that have been pre-washed with a surfactant (**FIG. 6***b*).

[0061] **FIG. 7***a* illustrates the use of a localized washing apparatus having concentric tubes.

[0062] **FIG. 7***b* is a cross-sectional view of the localized washing apparatus depicted in **FIG. 7***a*.

[0063] **FIG. 8** plots the contact angle of drops of fluid on carbon ink and dielectric ink surfaces as a function of the dispensing velocity.

[0064] **FIG. 9** is a schematic representation of one embodiment of an assay cartridge illustrating various fluidic components.

[0065] **FIG. 10** depicts the fluidic network in accordance with the schematic representation of **FIG. 9**.

[0066] **FIGS. 11***a*-**11***c* are top, bottom and isometric views, respectively, of the assay cartridge of **FIG. 9**; **FIG. 11***a* illustrates the fluidic networks formed on one side of the cartridge, **FIG. 11***b* illustrates the fluidic network formed on the other side of the cartridge and **FIG. 11***c* provides an isometric view with phantom lines to illustrate the entire cartridge fluidic network as seen within the cartridge body.

[0067] **FIG. 12** is a bottom view of the assay cartridge of **FIG. 9** illustrating one preferred layout for fluidic detectors to detect/monitor fluid movement.

[0068] **FIG. 13***a* is an exploded assembly drawing illustrating the laminar assemblage for the assay cartridge depicted in **FIG. 9**.

[0069] **FIG. 13***b* is a detail drawing of the gasket and electrode array cover layer depicted in **FIG. 13***a*.

[0070] **FIG. 14***a* is a schematic representation of another embodiment of an assay cartridge illustrating various fluidic components.

[0071] **FIG. 14***b* is an exploded assembly drawing illustrating the laminar assemblage for the two-piece assay cartridge depicted in **FIG. 14***a*.

[0072] **FIG. 14***c* is a detail drawing of the gasket and electrode array cover layer depicted in **FIG. 14***b*.

[0073] **FIG. 15***a* is a top view of the upper cartridge component of the assay cartridge depicted in **FIG. 14***b*.

[0074] **FIGS. 16***a* and **16***b* are top and bottom views, respectively, of the lower cartridge component of the assay cartridge depicted in **FIG. 14***b*.

[0075] **FIG. 17** is a bottom view of the assay cartridge of **FIG. 14***b* illustrating one preferred layout for fluidic detectors to detect/monitor fluid movement.