

sample from sample chamber 1420. Sample chamber 1420 also has sample introduction port 1416 and cap insert 1414 for sealing the port. Optionally, sample conduit branches 1440 and/or 1441 comprise reagent pill zones.

[0237] Reagent chambers 1425 and 1426 are, preferably, adapted to hold reagent ampoules. Reagent chamber 1425 is connected via a reagent vent conduit to vent port 1450 and via reagent conduit 1470 to sample conduit 1415. Reagent conduit 1470 is further connected via vent conduit 1482 to vent port 1481 which may be used to introduce air into reagent conduit 1470 and downstream conduits such as sample conduit branches 1440 and 1441. Advantageously, reagent conduit 1470 has an extended segment between vent conduit 1482 and sample conduit 1415 which may be used as a staging area for a defined volume of liquid reagent. Preferably, this extended segment also comprises a reagent pill zone for introducing a dry reagent into the liquid reagent held in reagent chamber 1425. Reagent chamber 1426 is connected via a vent conduit to vent port 1451 and via reagent conduit 1427 to sample conduit 1415 (first intersecting with reagent conduit 1470 just downstream from sample conduit 1415). Reagent conduits 1427 and 1470 preferably comprise Z-transitions near to the connection of the conduits to their corresponding reagent chambers to prevent premature leakage of the reagent from the chambers. Detection chambers 1445 and 1446 preferably, comprise 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, e.g., the electrode arrays of the invention as described above. Detection chambers 1445 and 1446 connect to sample conduit branches 1440 and 1441 and to waste conduits 1460 and 1461. Waste chambers 1430 and 1431 connect to waste conduits 1460 and 1461 and, via vent conduits to vent ports 1452 and 1453. Optionally, one detection chamber (and the associated fluidics and waste chamber) may be omitted.

[0238] Cartridge 1400 is adapted to carry out one and two step washed assays (assays that involve treating a detection chamber with one or two samples/reagents prior to conducting a wash step). A preferred embodiment of a one step washed assay comprises: i) introducing sample from sample chamber 1420 into detection chambers 1445 and/or 1446 via sample conduit branches 1440 and/or 1441 (optionally, the sample introduced into the detection chambers including reconstituted reagents such as labeled binding reagents and/or control/calibration reagents picked up in pill zones comprised in sample conduit branches 1440 and/or 1441) ii) washing detection chambers with a wash reagent contained in reagent chamber 1426 (the reagent preferably comprising an electrochemiluminescence coreactant and providing a suitable environment for an ECL

measurement) and iii) interrogating the contents of the detection chamber (preferably, by conducting an ECL measurement). For cartridges carrying out such a one step protocol, reagent chamber 1425 may be omitted (in which case, vent port 1481 may be directly connected to reagent conduit 1427 or sample conduit 1415). A preferred embodiment of a two-step washed assay comprises: i) introducing sample from sample chamber 1420 into detection chambers 1445 and/or 1446 via sample conduit branches 1440 and/or 1441 (optionally, the sample introduced into the detection chambers including reconstituted reagents such as blocking

agents, buffers, labeled binding reagents and/or control/calibration reagents picked up in pill zones comprised in sample conduit branches 1440 and/or 1441); ii) introducing a liquid reagent from reagent chamber 1425 into detection chambers 1445 and/or 1446 (optionally, the reagent introduced into the detection chambers including reconstituted reagents such as blocking agents, buffers, labeled binding reagents and/or control/calibration reagents picked up in pill zones comprised in reagent conduit 1470); iii) washing detection chambers with a wash reagent contained in reagent chamber 1426 (the reagent preferably comprising an electrochemiluminescence coreactant and providing a suitable environment for an ECL measurement) and iv) interrogating the contents of the detection chamber (preferably, by conducting an ECL measurement). Optionally, a wash step is included between steps (i) and (ii). Advantageously, the use of a two step format in binding assays allow analyte or other components in a sample to be bound to immobilized binding reagents in the detection chambers and washed out of the detection chamber prior to the introduction of labeled detection reagents (e.g., labeled binding reagents for use in sandwich binding assays or labeled analytes for use in competitive assays); carrying out assays in two steps may be advantageous in competitive assays and assays that suffer from large sample matrix effects or hook effects. Some assays may not require a wash step (e.g., non-washed ECL assays may be carried out by incorporating adding an ECL coreactant to the sample); for cartridges carrying out such non-washed assays (in one or two step formats), reagent chamber 1426 may be omitted.

[0240] As shown in FIG. 14b, a preferred embodiment of cartridge 1400 uses a laminar cartridge design employing a two part cartridge body (1410 and 1411) and cover layers 1401, 1402, 1403 and 1407. To allow for adequate sample and/or reagent volumes, the cartridge body has a thicker portion which includes features (channels, grooves, wells, compartments, etc.) that define, in part, the sample, reagent and waste chambers. The remainder of the cartridge is, preferably, much thinner so as to minimize cartridge weight, volume and material costs. The two part cartridge design is not required but is advantageous for producing the cartridge by low cost injection molding techniques by allowing the thicker regions of the cartridge body to be hollowed out thus reducing the amount of material needed to produce a cartridge, reducing the time required to cool the parts before ejection from an injection mold die and reducing the part deformation after release from the mold. In this hollowed out design, through-holes through the cartridge body can be provided for by tubes incorporated into body components 1410 and/or 1411 (see, e.g., tube 1439 in FIG. 14b). These tubes may be mated to tubes or holes in the other body component to form through-holes through the body. This mating can be accomplished by a variety of methods including tube mating methods known in the art. Preferred techniques include plastic welding techniques and/or the use of press fits (preferably, by mating a tapered tube with an outer diameter that decreases from d_{max} to d_{min} at its end with a tube that has an inner diameter between d_{max} and d_{min}). In an alternate embodiment, a one part cartridge body is used.

[0241] At least portions of the sample, reagent and vent conduits are formed by sealing cover 1403 on lower cartridge body part 1410. Detection chambers 1445 and 1446, portions of sample conduit branches 1440 and 1441, and portions of elongated reagent conduit 1470 are formed by