[0219] One preferred embodiment of the cartridge may be fabricated using a "lamination" process whereby the cartridge body's functional surfaces are sealed using cover layers to form the fluidic network. For example, recesses (e.g., channels, grooves, wells, etc.) one or more surfaces of the cartridge body to provide what is referred to herein as "functional surfaces". Sealing/mating of the fictional surfaces to cover layers forms a fluidic network comprising fluidic components (e.g., conduits, chambers, etc.) at least some of which are defined in part by the recesses in the cartridge body and in part by a surface of a cover layer. The cover layers are preferably comprised of plastic film such as mylar film. The cover layer may be coated with an adhesive to seal the cover layer against the cartridge layer. Other methods for mating the cover layer to the cartridge body will be known to the skilled artisan, e.g., the seal may be achieved by heat sealing, ultrasonic welding, RF (radio frequency) welding, by solvent welding (applying a solvent between the components that softens or partially dissolves one or both surfaces), by use of an intervening adhesive layer (e.g., a double sided adhesive tape, etc.). Advantageously, cartridge features that are created by patterned deposition (e.g., patterned deposition of electrode or dielectric layers and/or patterned deposition of reagents to form dry reagent pills or to form binding domains with immobilized binding reagents) are created on cover layers so as to take advantage of automation available to process plastic film in large sheets or rolls.

[0220] Recesses may be, e.g., molded in, etched in or machined from the cartridge body. By analogy, fluidic components may also be defined, at least in part, by recesses in a cover layer that is mated to a cartridge body. Fluidic components may also be defined, at least in part, by regions cutout from gasket layers disposed between the cartridge body and cover layers. Apertures in the cartridge body and/or cover layers may be used to provide for access ports to the fluidic network, e.g., sample introduction ports, vent ports, reagent addition ports and the like. Vent ports, preferably, allow the equilibration of fluid in the chambers with the atmosphere or to allow for the directed movement of fluid into or out of a specified chamber by the application of positive or negative pressure. Vent ports, preferably, are designed to prevent the leakage of liquid samples or reagents through the ports and may include aerosol-resistance filters, membrane or filter materials that permit air flow but act as barriers to aqueous solutions (e.g., filter or membranes made from porous hydrophobic materials such as Gortex), and materials that are porous to air but seal when they come in contact with aqueous solutions (e.g., cellulose gum impregnated filters).

[0221] Preferred embodiments include a cartridge having a cartridge body with a first side and a second, preferably opposing, side and one or more cover layers mated to the first side to form a first fluidic network therebetween and one or more cover layers mated to the second side to form a second fluidic network therebetween. Through-holes through the cartridge body (which may be formed by molding, etching, machining, etc.) may be used to link the first and second fluidic networks and to provide Z-transitions. Additional fluidic complexity can be built into a cartridge by employing a laminated cartridge body having multiple cartridge body layers and additional fluidic networks between these layers; through-holes through the various cartridge body layers are used to link the different fluidic networks.

[0222] A high degree of control over the movement of liquids in the cartridges of the invention may be attained, without the introduction of active valve elements in the cartridge, through the use of fluidic networks comprising capillary breaks. "Capillary break", as used herein, refers to a region in a fluid conduit that acts as a barrier to liquid moving through the conduit under capillary action or under the driving force of a low pressure gradient below a threshold pressure. In preferred examples of capillary breaks, application of a pressure above the threshold pressure acts to push the fluid past the barrier. Capillary breaks may be designed into fluid conduits by introducing, e.g., i) a transition, on a surface of a conduit, from a wettable surface to a less wettable surface (e.g., as indicated by the contact angle for water); ii) a transition in conduit width from a region of narrow width that promotes capillary flow to a region of wider width; iii) a transition, on a surface of a conduit, in roughness; iv) a sharp angle or change in direction and/or v) a change in cross-sectional geometry. In another embodiment, a fluid conduit has a flexible wall/diaphragm that impinges into the conduit and blocks flow driven by a pressure below a threshold pressure. Application of a higher pressure forces the flexible wall/diaphragm out of the flow path and lets fluid flow. Preferably, the diaphragm is made of a material (e.g., Gortex) that allows gas to pass through but prevents the flow of liquid up to a certain pressure. Preferred capillary breaks involve a sharp angle or change in direction in a fluid conduit, most preferably a "Z-transition" as described above.

[0223] In one embodiment of the invention, a liquid is introduced into a chamber comprising an outlet conduit that includes a capillary break (preferably a Z-transition). The liquid enters the outlet conduit but stops at the z-transition. A pressure gradient is then applied (e.g., by applying positive pressure to the chamber or negative pressure to the other end of the conduit) which cause the liquid to flow past the z-transition into the rest of the conduit.

[0224] The fluidic network may also comprise valves to control the flow of fluid through the cartridge. A variety of suitable valves (including mechanical valves, valves based on electrokinetic flow, valves based on differential heating, etc.) will be known to one of average skill in the art of assay cartridges or microfluidic devices. In preferred embodiments, however, at least one and more preferably all actively controlled valve elements are external to the cartridge. In one embodiment, a fluid conduit has a flexible wall/diaphragm that in the absence of external force allows fluid to pass through the conduit. Application of an external force on the wall/diaphragm (e.g., from a piston or via the application of gas or hydrostatic pressure) causes the diaphragm to impinge on the conduit, thus impeding the flow of fluid.

[0225] The fluidic network may include at least one viscosity measuring conduit, preferably linked to a sample chamber or sample conduit, having an inlet and an outlet. The conduit is adapted so that a liquid sample can be introduced into the conduit and the time it takes the liquid to move between two locations in the conduit can be timed (preferably using sensors such as impedance sensors or optical sensors in the cartridge or an associated cartridge