CLAIMS

1. An electrochemical system, comprising:
an electrochemical cell having a lower electrode and an upper electrode;
a meter connected to the electrochemical cell so that the meter applies a potential between the upper electrode and the lower electrode; and
a control unit connected to the meter so that the control unit determines a fill time of a sample introduced into the electrochemical cell and uses the fill time to calculate a concentration of an analyte in the sample in which the fill time is determined by measuring a current as a function of time after the potential is applied and then determining a current drop time based on the current as a function of time and in which the current drop time corresponds to the fill time of the sample.

2. The electrochemical system of claim 1, further comprising a heating element configured to heat at least a portion of the electrochemical cell.

3. The electrochemical system of claim 1, wherein the electrochemical cell comprises an immunosensor.

4. The electrochemical system of claim 3, wherein the immunosensor further comprises:
a first liquid reagent comprising an antibody conjugated to an enzyme in a buffer, the first liquid reagent being striped on the lower electrode and dried;
a second liquid reagent comprising ferricyanide, a substrate for the enzyme, and an electrochemical mediator in a dilute acid solution, the second liquid reagent being striped on the lower electrode and dried;
magnetic beads conjugated to an antigen, the magnetic beads being striped on the upper electrode and dried thereon;
a separator disposed between the lower and upper electrodes;
a reaction chamber formed in the separator and having the first reagent and the magnetic beads conjugated to the antigen disposed therein;
a detection chamber formed in the separator and having the second reagent disposed therein;
a fill chamber formed at least partially in the separator and one of the lower and upper electrodes, spaced a distance apart from the detection chamber, and overlapping at least a portion of the reaction chamber;

a vent formed at least partially in each of the separator, the lower electrode, and the upper electrode, spaced a distance apart from the reaction chamber, and overlapping at least a portion of the detection chamber;

a first sealing component having an incorporated anticoagulant coupled to one of the lower and upper electrodes, disposed over the vent, and configured to form a wall of the fill chamber and seal the vent; and

a second sealing component coupled to the other of the lower and upper electrodes, disposed over the vent, and configured to seal the vent.

5. The electrochemical system of claim 4, wherein the first sealing component comprises a hydrophilic adhesive tape.

6. The electrochemical system of claim 4, wherein at least one of the immunosensor, the meter, and the control unit include a configuration to measure a temperature of the sample.

7. The electrochemical system of claim 4, wherein the analyte comprises C-reactive protein.

8. The electrochemical system of claim 1, wherein the sample comprises blood.

9. The electrochemical system of claim 8, wherein the blood comprises whole blood.

10. A method for measuring a blood sample, comprising:
providing:
an immunosensor having two electrodes in spaced relation; and
a meter connected to the immunosensor so that the meter applies a potential between the two spaced electrodes of the immunosensor;
introducing a blood sample including an antigen into the immunosensor;
applying an electric potential between the two spaced electrodes while the blood sample is introduced;
calculating a fill time of the blood sample by measuring current as a function of time after the electric potential is applied and then determining a current drop time based on the current as a function of time; and
determining a concentration of the antigen in view of the fill time, in which the current drop time corresponds to the fill time of the sample.

11. The method of claim 10, wherein the immunosensor further comprises:

a reaction chamber and a detection chamber formed in a separator disposed between the two electrodes;

a fill chamber at least partially formed in the separator and one of the two electrodes, spaced a distance apart from the detection chamber, and overlapping at least a portion of the reaction chamber; and

a vent at least partially formed in the separator and the two electrodes, spaced a distance apart from the reaction chamber, and overlapping at least a portion of the detection chamber;

the method further comprising:

providing:

an antibody-enzyme conjugate in a first buffer and magnetic beads linked to an antigen in a second buffer in the reaction chamber;

ferricyanide, glucose, and a mediator in a dilute acid in the detection chamber;

a first seal over a first side of the vent that forms a wall of the fill chamber; and

a second seal over a second side of the vent,

wherein at least a portion of the blood sample moves from the fill chamber to the reaction chamber when introducing a blood sample into the immunosensor;

opening the vent after a pre-determined time by piercing at least one of the first and second seals, thereby allowing portions of the blood sample containing the antibody-enzyme conjugate that is not bound to the magnetic beads to move to the detection chamber;

catalyzing oxidation of the glucose in the detection chamber, which results in the formation of ferrocyanide;

electrochemically detecting a current from the ferrocyanide; and

determining a concentration of the antigen in the blood sample in view of the signal detected.

12. The method of claim 10, wherein calculating a fill time further comprises:

applying an electric potential between the working electrode and the counter electrode as the sample is introduced;

measuring cell current as a function of time; and

determining a current drop time based on cell current as a function of time, wherein the current drop time corresponds to the fill time of the sample.

13. The method of claim 10, further comprising

determining a level of haematocrit in the sample in view of the fill time of the sample, wherein determining the concentration of the antigen is performed in view of the determined level of haematocrit.

14. The method of claim 10, wherein the antigen comprises C-reactive protein.

15. The method of claim 10, further comprising:

measuring a temperature of the blood sample.