21. The strip according to claim 1, wherein said SPE is screen-printed directly onto said membrane at another end of the strip, opposite to the conjugation pad.

22. The strip according to claim 1, where said SPE comprises one or more working electrodes.

23. ~~The~~ An electrochemical lateral flow biosensor (ELFB) device comprising:

(a) The strip of claim 1 placed inside the casing or frame; and

(b) Electronic detector unit, to which said strip is connected using cable or wirelessly.

24. The device according to claim 23~~16~~, wherein said electronic detector unit is a potentiostat or galvanostat with electrochemical sensor interface.

25. The device according to claim 23 or 24~~any of claims 20 and 21~~, wherein said device further comprises a transmitter and an antenna for transmitting data from the device to an external system.

26. Method for assembling of the ELFB device of claim 23~~16~~ comprising the following steps:

(a) Preparation of the bioreceptor molecule;

(b) Surface functionalisation of the conjugate particles and immobilisation of said bioreceptor molecule onto the surface;

(c) Preparation of the EAC conjugate particles by either:

i. Immobilisation of the EAC onto the surface of the conjugate particles using the known immobilisation techniques (coating); or

ii. Introduction of the EAC inside the conjugate particles (filling), where said particles being filled are porous polymeric particles capable of releasing said EAC at the electrode through turning the voltage on.

(d) Coating the surface of the conjugate particles with the blocking agent in order to prevent non-specific bindings;

(e) Surface functionalisation of the SPE and immobilisation of the capture antibody onto the surface;

(f) Coating the surface of the SPE with a blocking agent in order to prevent non-specific bindings;

(g) Placing the polymeric strip membrane on the bottom part of the casing or frame;

(h) Dipping the conjugation pad into the liquid mixture of the conjugate particles prepared in steps (a)-(d), drying the conjugation pad and placing it over and in contact with the polymeric strip membrane, at one end of the membrane;

(i) Placing the sampling pad over and in contact with the conjugation pad;

(j) Placing the SPE modified in steps (f)-(g) over and in contact with the polymeric strip membrane, at another end of the membrane, opposite to the conjugation pad;

(k) Placing the wick pad over and in contact with the SPE;

(l) Closing the casing or frame with the upper part (cover) and connecting the electronic detector unit to the SPE.

27. Method for assembling of the ELFB device of claim 26, wherein said blocking agent is bovine serum albumin (BSA), casein or any suitable detergent.

28. An ELFB diagnostic system comprising the device of any one of claims 23-~~2520-22~~, an external receiver/recorder able to receive data transmitted by the device, and a computing platform or workstation able to store, process, display, or analyse the received data.

29. A method for the analysis or diagnostics comprising the following steps:

(a) Collecting the sample from any tested source, such as wastewater or biological liquid;

(b) Dropping the sample on the ELFB strip of any one of claims 1-22; and

(c) Acquiring the amperometric signal with the electronic detector unit.

30. The method according to claim 2922, further comprising the steps of transmitting the acquired amperometric signal or data obtained from the ELFB strip to the external receiver/recorder, and analysing said signal or data.

31. Use of the ELFB device of claim 2320 for detection and quantity analysis of bacterial, parasitic, viral infections, and tumours in biological liquids.

32. Use of the ELFB device of claim 2320 for detection and quantity analysis of toxins, mycotoxins, explosives and other pollutants in wastewater.

CLAIMS

What is claimed is:

1. The electrochemical lateral flow biosensor (ELFB) strip comprising:

   (a) Polymeric hydrophobic membrane, wherein said membrane provides a solid support and enables the capillary flow along the strip;

   (b) Conjugation pad, wherein said pad is placed over and in contact with said membrane at one end of the strip and contains the adsorbed dehydrated labelled conjugate particles,

      wherein said conjugate particles are coated with the biorecognition element of the assay and coated or filled with the electrochemically active component (EAC);

   (c) Sampling pad, wherein said pad is placed on top of and in contact with said conjugation pad and provides adsorption of the liquid sample;

   (d) Screen-printed electrode (SPE), wherein said electrode is coated with the immobilised capture antibodies; and

   (e) Wick pad, wherein said pad is placed on top and in contact with said screen-printed electrode (SPE) and provides absorption of excess reagents maintaining a lateral flow along the strip.

2. The strip according to claim 1, wherein said polymeric hydrophobic membrane is selected from nitrocellulose or cellulose acetate membrane.

3. The strip according to claim 1, wherein said conjugation pad is made of cross-linked silica, fibreglass, polyester or rayon.

4. The strip according to claim 1, wherein said labelled conjugate particles are colloidal gold or coloured, fluorescent, or paramagnetic mono dispersed polymeric particles.

5. The strip according to claim 4, wherein said colloidal gold particles are red-coloured gold nanoparticles.

6. The strip according to claim 4, wherein said polymeric particles are blue-coloured latex particles.

7. The strip according to claim 1, wherein said biorecognition element is antigen.

8. The strip according to claim 1, wherein said biorecognition element is antibody.

9. The strip according to claim 1, wherein said biorecognition element is DNA.

10. The strip according to claim 1, wherein said biorecognition element is aptamer.

11. The strip according to claim 1, wherein said biorecognition element is molecular imprint.

12. The strip according to claim 1, wherein said biorecognition element is lectin.

13. The strip according to claim 1, wherein said biorecognition element is ligand.

14. The strip according to claim 1, wherein said electrochemically active component (EAC) is Thionine.

15. The strip according to claim 1, wherein said EAC is Ferrocene.

16. The strip according to claim 1, wherein said EAC is any electroconductive polymer or polymer combinations.

17. The strip according to claim 1, wherein said EAC is a combination of any suitable redox molecules.

18. The strip according to claim 14, wherein said labelled conjugate particles coated with Ferrocene are adsorbed onto said conjugation pad together with hexacyanoferrate ions.

19. The strip according to claim 1, wherein said strip is made of a pad, flat piece or a unit of another shape, coated with or impregnated or otherwise.

20. The strip according to claim 1, wherein said SPE is placed over along and in contact with the polymeric strip membrane at another end of the strip, opposite to the conjugation pad.

21. The strip according to claim 1, wherein said SPE is screen-printed directly onto said membrane at another end of the strip, opposite to the conjugation pad.

22. The strip according to claim 1, where said SPE comprises one or more working electrodes.

23. An electrochemical lateral flow biosensor (ELFB) device comprising:

(a) The strip of claim 1 placed inside the casing or frame; and

(b) Electronic detector unit, to which said strip is connected using cable or wirelessly.

24. The device according to claim 23, wherein said electronic detector unit is a potentiostat or galvanostat with electrochemical sensor interface.

25. The device according to claim 23 or 24, wherein said device further comprises a transmitter and an antenna for transmitting data from the device to an external system.

26. Method for assembling of the ELFB device of claim 23 comprising the following steps:

(a) Preparation of the bioreceptor molecule;

(b) Surface functionalisation of the conjugate particles and immobilisation of said bioreceptor molecule onto the surface;

(c) Preparation of the EAC conjugate particles by either:

i. Immobilisation of the EAC onto the surface of the conjugate particles using the known immobilisation techniques (coating); or

ii. Introduction of the EAC inside the conjugate particles (filling), where said particles being filled are porous polymeric particles capable of releasing said EAC at the electrode through turning the voltage on.

(d) Coating the surface of the conjugate particles with the blocking agent in order to prevent non-specific bindings;

(e) Surface functionalisation of the SPE and immobilisation of the capture antibody onto the surface;

(f) Coating the surface of the SPE with a blocking agent in order to prevent non-specific bindings;

(g) Placing the polymeric strip membrane on the bottom part of the casing or frame;

(h) Dipping the conjugation pad into the liquid mixture of the conjugate particles prepared in steps (a)-(d), drying the conjugation pad and placing it over and in contact with the polymeric strip membrane, at one end of the membrane;

(i) Placing the sampling pad over and in contact with the conjugation pad;

(j) Placing the SPE modified in steps (f)-(g) over and in contact with the polymeric strip membrane, at another end of the membrane, opposite to the conjugation pad;

(k) Placing the wick pad over and in contact with the SPE;

(l) Closing the casing or frame with the upper part (cover) and connecting the electronic detector unit to the SPE.

27. Method for assembling of the ELFB device of claim 26, wherein said blocking agent is bovine serum albumin (BSA), casein or any suitable detergent.

28. An ELFB diagnostic system comprising the device of any one of claims 23-25, an external receiver/recorder able to receive data transmitted by the device, and a computing platform or workstation able to store, process, display, or analyse the received data.

29. A method for the analysis or diagnostics comprising the following steps:

(a) Collecting the sample from any tested source, such as wastewater or biological liquid;

(b) Dropping the sample on the ELFB strip of any one of claims 1-22; and

(c) Acquiring the amperometric signal with the electronic detector unit.

30. The method according to claim 29, further comprising the steps of transmitting the acquired amperometric signal or data obtained from the ELFB strip to the external receiver/recorder, and analysing said signal or data.

31. Use of the ELFB device of claim 23 for detection and quantity analysis of bacterial, parasitic, viral infections, and tumours in biological liquids.

32. Use of the ELFB device of claim 23 for detection and quantity analysis of toxins, mycotoxins, explosives and other pollutants in wastewater.