[0020] Electrically-insulating substrate **12** can be any suitable electrically-insulating substrate known to one skilled in the art including, for example, a nylon substrate, polycarbonate substrate, a polyimide substrate, a polyvinyl chloride substrate, a polyethylene substrate, a polypropylene substrate, a glycolated polyester (PETG) substrate, or a polyester substrate. The electrically-insulating substrate can have any suitable dimensions including, for example, a width dimension of about 5 mm, a length dimension of about 27 mm and a thickness dimension of about 0.5 mm.

[0021] Insulation layer **16** can be formed, for example, from a screen printable insulating ink. Such a screen printable insulating ink is commercially available from Ercon of Wareham, Mass. U.S.A. under the name "Insulayer." Patterned adhesive layer **20** can be formed, for example, from a screen-printable pressure sensitive adhesive commercially available from Apollo Adhesives, Tamworth, Staffordshire, UK.

[0022] Hydrophilic layer **22** can be, for example, a clear film with hydrophilic properties that promote wetting and filling of electrochemical-based analytical test strip **10** by a fluid sample (e.g., a whole blood sample). Such clear films are commercially available from, for example, 3M of Minneapolis, Minn. U.S.A. Top film **24** can be, for example, a clear film overprinted by black decorative ink. A suitable clear film is commercially available from Tape Specialities, Tring, Hertfordshire, UK.

[0023] Enzymatic reagent layer **18** can include any suitable enzymatic reagents, with the selection of enzymatic reagents being dependent on the analyte to be determined. For example, if glucose is to be determined in a blood sample, enzymatic reagent layer **18** can include oxidase or glucose dehydrogenase along with other components necessary for functional operation. Further details regarding enzymatic reagent layers, and electrochemical-based analytical test strips in general, are in U.S. Pat. No. 6,241,862, the contents of which are hereby fully incorporated by reference.

[0024] Electrochemical-based analytical test strip **10** can be manufactured, for example, by the sequential aligned formation of patterned conductor layer **14**, insulation layer **16** (with electrode exposure window **17** extending therethrough), enzymatic reagent layer **18**, patterned adhesive layer **20**, hydrophilic layer **22** and top film **24** onto electrically-insulating substrate **12**. Any suitable techniques known to one skilled in the art can be used to accomplish such sequential aligned formation, including, for example, screen printing, photolithography, photogravure, chemical vapour deposition and tape lamination techniques.

[0025] **FIG. 2** is a simplified plan view of patterned conductive layer **14** of electrochemical-based analytical test strip **10**. Patterned conductive layer **14** includes a counter electrode **26** (also referred to as a reference electrode), a first working electrode **28**, a second working electrode **30** and a contact bar **32**. Although electrochemical-based analytical test strip **10** is depicted as including three electrodes, embodiments of electrochemical-based analytical test strips according to the present invention can include any suitable number of electrodes.

[0026] Counter electrode **26**, first working electrode **28** and second working electrode **30** can be formed of any suitable electrode metal including, for example, gold, palladium, platinum, indium and titanium-palladium alloys. The formation of such metal electrodes typically results in a metal electrode with a smooth, albeit hydrophobic, surface.

[0027] **FIG. 3** is a simplified plan view of a portion of electrically-insulating substrate **12**, patterned conductive layer **14** and insulating layer **16** (shaded with cross-hatching) of electrochemical-based analytical test strip **10**. Electrode exposure window **17** of insulation layer **16** exposes a portion of counter electrode **26**, a portion of first working electrode **28** and a portion of second working electrode **30**, namely counter electrode exposed portion **26'**, first working electrode exposed portion **28'** and second working electrode exposed portion **30'**. During use, a fluid sample is communicated to electrode exposure window **17** and thereby operatively contacted with counter electrode exposed portion **26'**, first working electrode exposed portion **28'** and second working electrode exposed portion **30'**.

[0028] Counter electrode exposed portion **26'**, first working electrode exposed portion **28'** and second working electrode exposed portion **30'** can have any suitable dimensions. For example, counter electrode exposed portion **26'** can have a width dimension of about 0.72 mm and a length dimension of about 1.6 mm, while first working electrode exposed portion **28'** and second working electrode exposed portion **30'** can each have a width dimension of about 0.72 mm and a length dimension of about 0.8 mm.

[0029] Following formation of insulation layer **16**, patterned conductive layer **14**, and the disposition of hydrophilicity-enhancing moieties on the counter electrode exposed portion **26'**, the first working electrode exposed portion **28'** and the second working electrode exposed portion **30'**, enzymatic reagent layer **18** is applied over counter electrode exposed portion **26'**, first working electrode exposed portion **28'** and second working exposed portion **30'**. Details regarding the use of such electrodes, electrode exposed portions and enzymatic reagent layers for the determination of the concentrations of analytes in a fluid sample, albeit without the hydrophilicity-enhancing moieties described in this disclosure, are in U.S. Pat. No. 6,733,655, which is hereby fully incorporated by reference.

[0030] During use of electrochemical-based analytical test strip **10** to determine an analyte concentration in a fluid sample (e.g., blood glucose concentration in a whole blood sample), counter electrode **26**, first working electrode **28** and second working electrode **30** are employed to monitor an electrochemical reaction induced current of interest. The magnitude of such a current can then be correlated with the amount of analyte present in the fluid sample under investigation.

[0031] The current measured by a working electrode is governed by the following simplified equation:

$$i=nFAJ \qquad \text{Eq. 1}$$

[0032] where:

[0033] i is a measured current;

[0034] n is a number of electrons generated during the reaction;

[0035] F is the Faraday constant;