

TABLE IV-continued
RATIO OF TRANSMITTED LIGHT
THROUGH REAGENT COATED LIGHT SOURCE
(GLUCOSE COATING ON LED)

GLUCOSE CONC. mg/dL	T_{ref}/T_{sam}	$\ln(T_{ref}/T_{sam})$
25	1.65	0.50
25	1.82	0.60
50	1.83	0.60
50	2.04	0.71
100	3.75	1.32
250	3.43	1.23
250	3.96	1.38
500	5.14	1.64
1000	4.07	1.40
1000	5.56	1.71
1000	5.21	1.65

A plot of the natural logarithms of the ratio values as a function of glucose concentration is shown in FIG. 7. The plot demonstrates the increase in the log-ratio value with glucose concentration.

EXAMPLE 3

Reagent Coated Light Source—Fluorescent Reagent Paper

A fluorescent reagent paper is made by dipping filter paper in a solution containing a fluorophore. The fluorophore can be pyrene, which emits light of wavelength above 400 nm, maximum about 420 nm, when excited with ultraviolet radiation of wavelength 316 nm. At high pyrene concentration, a second larger fluorescence peak occurs at longer wavelengths with a maximum at about 480 nm.

The amount of pyrene on the paper is varied by the use of different concentrations of pyrene solution as follows:

1×10^{-2} M 0.202 g of Pyrene (M.W. 202)/100 mL of cyclohexane.

1×10^{-3} M Serial dilution of above in cyclohexane.

1×10^{-4} M Serial dilution of above in cyclohexane.

1×10^{-5} M Serial dilution of above in cyclohexane.

1×10^{-6} M Serial dilution of above in cyclohexane.

Ultraviolet light is brought to the paper by means of a source capable of emitting uv radiation and a light pipe, such as a fiber optic bundle. One end of the fiber optic bundle receives the uv light and guides it to the other end, which is positioned in a holder. The end of the light guide is visible through an opening in the holder.

A piece of dry reagent paper is placed over the opening in the holder in such a way that it will be illuminated by uv light from the light guide.

The fluorescence emission is measured with a photodetector. A cut-off filter or a band pass filter (420 nm or 480 nm) is placed in the light path between the reagent paper and the detector to eliminate uv excitation radiation (316 nm).

The uv radiation is turned on. The light emitted from the dry pad is measured. This is the reference signal (T_{ref}). A drop of pyrene solution is placed on the pad. The new light level is read within about 15 seconds. This is the sample signal (T_{sam}). The paper is removed and a new dry pad put in place.

Fluorescence intensity increases with increasing pyrene concentration. The ratio obtained by dividing the

dry pad reference value (T_{ref}) by the sample signal value (T_{sam}) represents a quantitative relationship between measured fluorescence and pyrene concentration.

In this Example, the fluorophore is introduced to the system via solutions of varying concentration to demonstrate how the system can be used to measure fluorophore concentration. In some systems, fluorophore is produced in situ; for example, by enzyme cleavage to produce a fluorescent compound, which is either non-fluorescent before enzyme cleavage or which fluoresces at a different wavelength. In such systems, the coated light source method permits the quantitation of the fluorophore produced, and by extension, it also permits quantitation of the reaction(s) that produce the fluorophore in situ.

In summary, this invention provides a method and a device for making rapid, accurate and reproducible optical measurements on a specimen under test by direct illumination of the specimen. The device minimizes the amount of illumination dissipated or lost between the light source and the specimen. The device provides optical measurements that are not sensitive to changes in the orientation of the specimen in a specimen holder and not susceptible to variations in the distance between the light source and the specimen as in prior art devices.

What is claimed is:

1. A device for determining the presence or concentration of a ligand in a specimen by measuring light, wherein the device consisting essentially of

light source means for providing illumination;

light responsive means for generating an electrical signal in response to light; and

means for measuring the electrical signal from the light responsive means;

wherein the light source has an end surface through which or from which light passes; and

said end surface contains a reagent that is chemically reactive with a ligand in a specimen; and

light from the light source passes through the end surface and through or from the end surface to the light responsive means.

2. Device according to claim 1, wherein the coating contains the ligand.

3. Device according to claim 2, wherein the coating contains the reaction product of the ligand and the reagent.

4. Device according to claim 1, wherein the coating contains a solid, transparent or translucent support matrix.

5. Device according to claim 4, wherein the support matrix is a non-woven paper web.

6. Device according to claim 4, wherein the light source is a light-emitting diode having a substantially flat transparent or translucent end surface through which the light passes, and wherein the coating is on the flat surface.

7. Device according to claim 6, wherein the light-emitting diode emits substantially monochromatic light.

8. Device according to claim 6, wherein the transmitted light from the coating has a longitudinal axis and the light responsive means is a photodetector having an optical axis that substantially coincides with the longitudinal axis of the transmitted light.

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