CLAIMS

1. A non-enzymatic colorimetric test strip for detecting the presence of ethanol in a vapour sample, the test strip comprising:

a substrate, the substrate comprising:

a first portion being an area on a major surface of the substrate coated with a substance defining a sample detection zone, leaving a region in the sample detection zone uncoated;

a second portion being another area on the major surface of the substrate coated with a substance to define a control zone, leaving a region in the control zone uncoated;

a first dye deposited and immobilized onto the uncoated region of the sample detection zone to be in contact with the sample for detecting the presence of ethanol in the vapour sample by a colour change in the first dye; and

a second dye deposited and immobilized onto the uncoated region of the control zone to be used as a control,

wherein the first dye and the second dye are each a single-component dye.

2. The test strip according to claim 1, wherein the first dye and the second dye are organic solvatochromic dyes.

3. The test strip according to claim 2, wherein the first dye and the second dye are Nile red dyes.

4. The test strip according to claim 1, wherein the sample detection zone and the control zone are in a spaced apart configuration.

5. The test strip according to claim 1, wherein the sample detection zone and the control zone are in a spaced apart and adjacent configuration.

6. The test strip according to claim 1, wherein the substance coated onto the first portion and the second portion of the substrate is wax.

7. The test strip according to claim 6, wherein the wax is printed onto the first portion and the second portion of the substrate to form patterns to confine the first dye and the second dye in fixed areas within the respective sample detection zone and the control zone.

8. The test strip according to claim 1, wherein the uncoated region in the sample detection zone has the same dimension as the uncoated region in the control zone.

9. The test strip according to claim 1, wherein the uncoated region in the sample detection zone and the first dye are positioned in the center of the sample detection zone.

10. The test strip according to claim 1, wherein the uncoated region in the control zone and the second dye are positioned in the center of the control zone.

11. The test strip according to claim 1, wherein the uncoated region in the sample detection zone and the uncoated region in the control zone are circular in shape.

12. The test strip according to claim 1, wherein the substrate is made of material selected from the group consisting of nitrocellulose membrane, cellulose paper and plastic material including polyethylene terephthalate.

13. The test strip according to claim 12, wherein the substrate is made of polyethylene terephthalate material, coated with a layer of silica.

14. A method of detecting the presence of ethanol in a vapour sample, the method comprising:

placing a test strip in close proximity to a vapour sample to be tested, the test strip comprising:

a substrate having a sample detection zone, a control zone and a white background;

a first dye deposited and immobilized onto a region within the sample detection zone; and

a second dye deposited and immobilized onto a region within the control zone,

wherein the first dye and the second dye are each a single-component dye;

allowing the vapour sample to come into contact with the first dye in the sample detection zone;

capturing an image of the entire test strip using an image capture device;

performing image analysis of the captured image to quantify the ethanol vapour concentration based on the colour intensity change on the first dye in the sample detection zone relative to the second dye in the control zone;

wherein a colour change of the first dye in the sample detection zone indicates the presence of ethanol in the vapour sample and the difference in the colour intensity of the first dye in the sample detection relative to the second dye in the control zone determines the concentration of ethanol present in the vapour sample.

15. The method according to claim 14, wherein the step of image analysis further comprises:

normalising the colour intensity measured of the first dye in the sample detection zone relative to the colour intensity of the second dye in the colour zone; and

calculating and obtaining a value of normalized colour intensity, R, of the first dye in the sample detection zone relative to the second dye in the control zone, wherein the value R is determined by the following equation (I):

$$\text{Normalized colour intensity, } R = (Is / Bs) / (Ic / Bc) \qquad \text{(I)}$$

wherein

Is denotes the colour intensity of the first dye in the sample detection zone,

Bs denotes the colour intensity of the white background near the sample detection zone,

Ic denotes the colour intensity of the second dye in the control zone,

Bc denotes the colour intensity of the white background near the control zone.

16. The method according to claim 15, wherein a colour change of the first dye in the sample detection zone is indicated by the value of normalized red colour intensity, R.

17. The method according to claim 16, further comprises:

comparing the value R to a calibration curve to determine the concentration of ethanol in the vapour sample.

18. The method according to claim 15, wherein the step of image analysis is performed by the image capture device.

19. The method according to claim 15, wherein the method further comprises:

transmitting the captured image to an image analysis device for analysis, wherein the step of transmitting is carried out by the image capture device, configured to transmit data to the image analysis device.

20. The method according to claim 19, wherein the step of image analysis is performed by the image analysis device.

21. The method according to claim 18 or 20, wherein the image capture device or the image analysis device comprises a processor configured to calculate and obtain the value of normalized colour intensity R, of the first dye in the sample detection zone relative to the colour intensity of the second dye in the control zone.

22. The method according to claim 15, wherein the method further comprises:

presenting a message via a user interface, wherein the message includes results of the analysis of the vapour sample.

23. The method according to claim 14 or 15, wherein the vapour sample is a breath sample.

24. The method according to claim 14 or 15, wherein the vapour sample is vapour from an alcoholic beverage.

25. The method according to claim 14 or 15, wherein the vapour sample is vapour from an ethanol/water mixture.

26. The method according to claim 24, wherein the method further comprises:

determining, depending on the value of the concentration of ethanol obtained, if the beverage is authentic.