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Enhanced Color Sensitivity for Colorimetric-based Chemical Analysis (2017-055)

Provides greater color-change sensitivity and uniformity, a lower limit of detection, and greater reproducibility of quantitative color reading for chemical analysis

Market Overview

This novel technology for colorimetric chemical analysis significantly enhances color change intensity and uniformity upon exposure to a target substance when compared to conventional color-indicating substrates. This technology thus has application to any colorimetric-based chemical assay, such as urinalysis. The global urinalysis market was estimated to be 1.37 billion USD in 2015 and has only continued to grow since then. As one example for its application, this invention has potential to greatly impact the diagnoses and monitoring of phenylketonuria (PKU), an inborn metabolic disorder that results in decreased metabolism of the amino acid phenylalanine (Phe) and affects about 1 in 10,000 individuals. Most countries screen newborns for PKU as it can lead to brain damage, intellectual disabilities, and seizures when left untreated, but populations in developing regions may lack access to the necessary infrastructure for testing. Clemson University researchers have developed a technology that has the capability to not only improve upon conventional color-indicating substrates for urinalysis, but also to reduce the frequency, high cost, and discomfort of collecting the blood samples that are currently required for monitoring blood Phe levels for individuals with PKU. With further development, this invention could also potentially be used as a urine test to monitor diabetes and kidney function, or essentially for any colorimetric chemical or biochemical assay to provide enhanced sensitivity, color uniformity, and at lower limits of detection.

Application

Testing of chemical and biochemical agents

Stage of Development

Preliminary prototype

Advantages

- Enhanced color change intensity and uniformity, making test results easier to interpret
- Greater color-change sensitivity, ensuring accurate results
- Manufactured from relatively inexpensive materials, reducing product costs

Technical Summary

This novel coupon design significantly improves color change intensity and uniformity upon exposure to a target analyte in a test solution. This coupon consists of an absorbent disk with the outside dimension ranging from a few millimeters to tens of millimeters. The coupons can be made out of a layer of absorbent material, such as cotton or cellulose, with a central hole up to several millimeters in diameter formed perpendicular to the surface plane of the coupon. By this design when exposed to a test liquid, the cavity is capable of trapping and holding a column of liquid by a combination of surface tension from the liquid and the wicking properties of the absorbent coupon material itself. The cavity, which supports a column of the test liquid, is where the enhancement of the color change and color uniformity is observed when

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compared to the color change in the absorbent material of the coupon. This novel coupon design has been developed in conjunction with colorimetric analysis methods for the testing of analytes in liquids using digital photography under controlled lighting combined with quantitative color interpretation using a numeric color scale, such as the RGB (red-green-blue) color scale, which provides color intensity values between 0 and 255. This method essentially enables chemical spectroscopy to be conducted for the quantitative measurement of the concentration of targeted analytes without the use of expensive laboratory spectroscopy equipment, thus facilitating its use in the field or at home for chemical analysis.

App Type	Country	Serial No.	Patent No.	CURF Ref. Number	Inventors
Provisional	United States	62/554,873	NA	2017-055	Dr. Robert Latour

About the Inventor

Dr. Robert Latour holds the endowed-chair position of McQueen-Quattlebaum Professor in the Department of Bioengineering at Clemson University. He earned his Ph.D. in Bioengineering at University of Pennsylvania in 1989. Dr. Latour directs both the Biomolecular Interactions Lab and the Biomolecular Modeling Lab at Clemson. His research interests pertain to the study of the thermodynamics of biomolecular interactions with emphasis upon nonspecific protein-surface and specific protein-receptor interactions.

For More Information

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