UWM RESEARCH FOUNDATION Technology Overview

Disposable Digital pH Sensor

OTT ID #1372

TECHNOLOGY

The inventors have developed an electrochemical pH paper sensor. By combining this with screen-printed technology and a hand-held reader, the device offers an accurate and precise pH sensor that is also inexpensive, portable (miniaturized) and eco-friendly. The hand-held electrochemical reader and screen-printed electrodes can be used as disposable or can also be reused several times. The paper test strip for liquid samples is for one-time-use which serves for sample delivery and storage. This electrochemical pH paper sensor can also be combined with other electrochemical detection technologies for simultaneous multiplex detections such as glucose, heavy metals etc.

There are currently two common ways to measure pH, a pH meter or pH paper. Both of these methods present problems with testing. A pH meter, while accurate, must be used with care and is difficult to maintain. Specifically they must be calibrated and cleaned before each use, and this can be both expensive and timely. Large volumes of liquid must also be tested. The use of pH paper as a measurement tool is a very subjective and semi-quantitative. pH paper, while inexpensive, lacks the ability to give an exact measurement of a solution and is only accurate for a quick check of whether a solution is acidic, basic, or neutral. Our new disposable digital pH sensor solves both of these issues by combining the accuracy of a pH meter, while using disposable, inexpensive, and easy to use test paper.

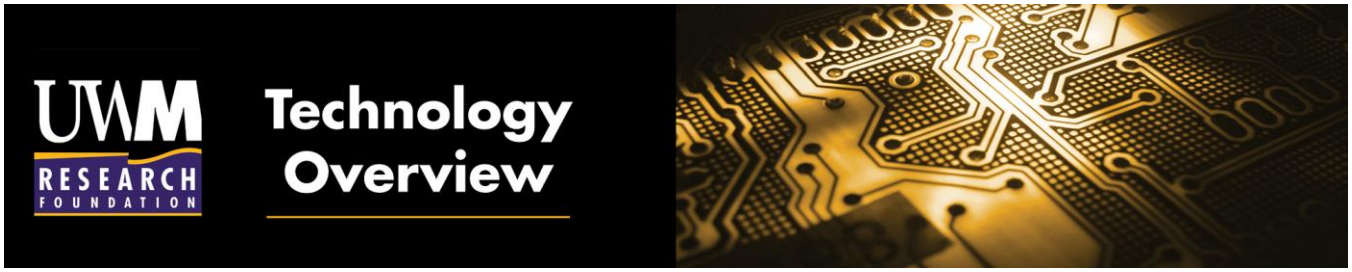
FEATURES/BENEFITS

- **More Accurate –** Increased pH testing accuracy read to the second decimal. Measures a very wide pH range
- **Easy to Read–** Digital readout for easy quick and easy viewing
- **Portable** – Compact handheld electrode for convenient usage
- **Inexpensive–** Single use disposable paper used with multi-use electrode for low cost measurements
- **Easy to Use –** Only a small sample is needed for testing
- **Minimal Contamination-**The patterned paper fluidic channel can minimize contamination

INTELLECTUAL PROPERTY

A United States Provisional Patent has been filed for this invention.

This technology is part of an active and ongoing research program and is seeking partners for development of the final product. It is available for developmental research support/licensing under either exclusive or non-exclusive terms.



MARKETS

pH meters are used in numerous end-use applications including laboratory use, pharmaceutical use and food science. Technological advances and portable design in pH meters are some of the major drivers for this market.

The global laboratory products market was estimated as a $38 billion dollar industry in 2012, with large markets in the U.S ($14.9 million), China ($1.3 billion) and India ($1.4 billion). With respect to changing technology, it is estimated that 20% of all instrumentation and equipment in the modern research laboratory will need replacements within the next five years.

Many of the instruments that will need replacements include detectors and sensors. The industry is forecasted to grow 1.8% in 2014 and continue to grow an additional 2.2% in 2015, with an expected five-year compound annual growth rate (CAGR) of 11.2%.

INVENTORS

Sundaram Gunasekaran
Ph.D., Agriculture Engineering

Dr. Gunasekaran is currently a Professor in the Biological Systems Engineering department at the University of Wisconsin-Madison. He holds a Ph.D. in Agricultural Engineering from the University of Illinois, Urbana. Dr. Gunasekaran's primary interests are in areas of engineering properties of food and biomaterials with special emphasis on rheological properties. He also has interests in sensors and instrumentation, specifically in the area of the nondestructive evaluation of properties and quality of food materials and development of biosensors for measuring certain allergens and toxins.

Jiang Yang
Ph.D., Biological Systems Engineering

Dr. Yang is currently a Research Fellow in Department of Chemistry at Stanford University and a Visiting Professor at Center of Environmental, Natural Resources and Energy Law in Fudan University. He holds a Ph.D. in Biological Systems Engineering from the University of Wisconsin-Madison. Dr. Yang's research interests cover plasmonic material synthesis and their applications in SERS and MEF, liquid and solid-phase protein and nucleic acid microarrays, electrochemical biosensors, electrochemical energy devices and microfluidics. He is particularly interested in applying these sensors and devices in disease diagnostics and food quality and safety controls.

Woo-Jin Chang
Ph.D., Biological Engineering

Dr. Chang is currently an Assistant Professor of Mechanical Engineering at the University of Wisconsin-Milwaukee. He holds a Ph.D. in Biological Engineering from Inha University (Republic of Korea). Dr. Chang has multiple research interests including biosensors, BioMEMS and microfluidic device development, field effect transistor (FET) biosensors, microfluidic aqueous two-phase extraction systems and microfluidic cell culture and monitoring.

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