WiSys TECHNOLOGY FOUNDATION™

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Reusable Enzyme-Free Glucose Sensor Offers Greater Stability, Longer Shelf-Life and Easier Fabrication

Market and Background

The global self-monitoring blood glucose (SMBG) market was estimated at USD 13.2 billion in 2017 and is expected to grow to 25 billion in 2026, representing a CAGR of more than 7%. The primary driver of worldwide growth in this market is urbanization and the associated increase in obesity, unhealthy diet and physical inactivity leading to a higher incidence of diabetes. Currently, North America dominates the market, followed by Europe and the Asia Pacific, which is the fastest growing region.

Traditional SMBG sensors and strips are mainly enzyme-based. Although enzymes offer high glucose specificity, there are several drawbacks to these types of sensors. The enzymes have a short life span due to loss of activity over time. This loss and limitation of activity can be accelerated by exposure to humidity and temperature extremes during storage and transportation. In addition, during use, enzyme reactions require a relatively neutral environment. While normal blood samples meet this requirement, samples from other body fluids might be more acidic or exhibit other less favorable reaction conditions. Beyond medical applications, samples from food production and environmental testing might also present harsher conditions.

Research and Development Status:

An assistant professor of analytical chemistry and inventor from the University of Wisconsin Oshkosh has developed a non-enzymatic glucose sensing device using composite materials made of conductive polymers and metal nanoparticle catalysts. For routine blood glucose analysis, this sensor has the potential to offer several benefits over its enzymatic counterparts, including increased stability, reusability, easier fabrication and lower cost. The device also has the potential to overcome limitations of less ideal pH and temperature conditions, making it suitable for monitoring other body fluids as well as environmental and food production samples.

A prototype sensor in the form of a glucose strip has been developed and tested for factors such as applied potential, scan rates, glucose concentrations, and sensitivity. Preliminary results have shown the device to reproducibly reach a practical detection limit as low as 1.8 mg/dL, which is significantly lower than the 10 mg/dL detection limit offered by most test strips currently on the market. The device response time is less than 15 seconds. Continued refinement of this technology is underway, including further optimization of polymer and metal catalyst materials.

Applications:

- Routine blood glucose monitoring
- Monitoring of body fluids under more extreme conditions
- Food production
- Environmental monitoring

Key Benefits:

- Active under harsher pH and temperature conditions
- Enhanced stability
- Better reproducibility

- Reusable
- Requires less stringent production and storage conditions
- Easier fabrication
- Longer shelf-life
- Lower manufacturing cost

Intellectual Property:

A U.S. Patent Application has been filed for this technology. For more information, please contact Jennifer Cook at jennifer@wisys.org or by phone at 608-316-4131.

Development and Commercialization Needs:

WiSys is currently seeking a strategic partner interested in further developing this non-enzymatic glucose sensor technology, ultimately providing a route to market for its commercialization.