Implantable MEMS-based sensor for long-term and continuous glucose monitoring

Current affinity based approaches for continuous glucose monitoring suffer from limited mechanical reliability, poor reversibility, and significant signal drift. The technology is an affinity based sensor that uses an analyte-binding polymer incorporated into a microelectromechanical system (MEMS) to dynamically monitor the concentration of blood solutes such as glucose. This system provides excellent reversibility and stability, and is suitable for implantation and use in long-term analyte monitoring.

Highly sensitive, real-time monitoring of glucose and other blood solutes

This technology is an affinity based sensor in which the sensor can reversibly bind the analyte of interest, and the mechanical and electronic properties of the polymer sensor are altered upon binding. The system contains a resonating membrane, which is supported by the polymer. The membrane can be driven to resonate and its frequency is monitored via a fluctuating capacitance signal. The capacitance signal is shifted based on the stiffness of the polymer, which is dependent on solute binding and concentration. The change in dielectric constant of the polymer can also be measured directly by capacitance to determine solute concentration.

A prototype of the technology has been shown to be capable of detecting serum solutes at physiologically relevant concentration with a response time constant of approximately 3 minutes.

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Applications:
- Monitoring concentrations of glucose and other solutes found in blood
- Long-term, continuous implantable glucose sensor
• Real-time monitoring and management of blood glucose levels in diabetic patients
• Monitoring fermentation of alcoholic beverages

Advantages:
• Matrix can be replaced with different polymers
• Fully reversible sensor
• Continuous real-time monitoring
• Sensor is monitored entirely electronically using straightforward output
• Small size allows for being a minimally-invasive monitoring of analytes

Patent Information:
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Patent Pending (US 20160370362)
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Related Publications:

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