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Flexible, Biocompatible Microfluidics-inspired Micro-reference Electrodes for Sensing Applications

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OTHER INFORMATION

CATEGORIZED AS

- » **Materials & Chemicals**
 - » Polymers
- » **Sensors & Instrumentation**
 - » Biosensors
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BRIEF DESCRIPTION

Researchers at UCI have created miniaturized, flexible, biocompatible reference electrode with a streamline design capable of being used in a variety of different laboratory and clinical environments.

TECHNOLOGY DESCRIPTION

Electrochemical sensors are incorporated to many standard laboratory setups from those measuring pH of a solution to those detecting biological species in a sample. Most systems include a glass-encased reference electrode (Ag/AgCl electrode) with an ion-selective membrane and chlorinated silver wires in a fixed conductive solution to provide a stable potential. Other electrodes, i.e. working and counter electrodes, are placed in the sample solution, and various approaches, such as amperometry and cyclic voltammetry can be done to indicate the pH level or analyte concentrations. Systems with these types of standard glass reference electrodes provide very linear and stable measurements. However, the bulkiness of the glass Ag/AgCl electrodes and incompatibility with biological systems, however, limits the reproducibility, biocompatibility, and use of these electrodes in diverse settings.

Researchers at UCI have developed a way to combat these problems by creating a polymer-encased reference electrode using flexible, durable, and biocompatible polymer materials. The assembly contains 3 major layers (bottom to top): 1) a polymer substrate, 2) a microfabricated miniature reference electrode and 3) a polymer cap designed with microfluidic features. The microfluidic features include a reservoir for the conductive solution that interfaces with the reference electrode, integration of an ion semi-permeable membrane and a unique fluid port for filling of the conductive solution. Additionally, different conductive solutions and polymers can be utilized to vary and optimize the properties of the sensor for a range of different applications. This technology aims to maintain the linearity and stability of measurements while miniaturizing the system and increasing the potential to be implemented into biological, chemical and biochemical environments.

SUGGESTED USES

- Incorporation into standard laboratory equipment or hardware
- Use in chemical measurements systems
- Incorporation into biocompatible systems or implantable devices

FEATURES/BENEFITS

- Use of biocompatible, flexible, and durable materials
- Probe properties (e.g. conductive solution) can be easily changed or varied based on application
- Miniaturized system
- Simple assembly
- Maintains stability and linearity of measurements
- Can be used in a variety of different environments (e.g. implantable for biological applications)

STATE OF DEVELOPMENT

This device is in the conceptual stage. Several steps required for manufacturing have been assessed and completed.

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [At Home Fetal Electrocardiogram/Heartrate Monitor for Congenital Heart Defect Diagnosis](#)
- ▶ [Tracking Diet And Nutrition with a Wearable Bio-lot](#)
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