Aptamer functionalized shrink-induced high surface area electrochemical sensors

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OTHER INFORMATION

CATEGORIZED AS

- **Biotechnology**
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  - Proteomics
- **Materials & Chemicals**
  - Biological
- **Medical**
  - Diagnostics
  - Screening
- **Sensors & Instrumentation**
  - Biosensors

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BRIEF DESCRIPTION

A low-cost method of manufacturing a, rough high surface area electrodes with a dissolvable polymer coating to improve surface wettability and electrochemical sensing.

FULL DESCRIPTION

An electrochemical sensor's performance is highly dependent on the electrode electrochemical active surface area (EASA) that interfaces with the sample. Maintaining a large surface area when miniaturizing electrochemical sensors poses a manufacturing challenging. Established methodologies of increasing EASA for miniature sensors include complex chemical deposition methodologies that require expensive equipment and clean-room facilities. More recently, research has shown that enhanced EASE can be realized by heat-shrinking a polymer substrate coated with metal thin film electrodes. The heat-shrinking process is low-cost and does not require sophisticated equipment or clean rooms. However simple the heat shrink process is, there are constraints such as "secondary wrinkling" and poor wettability that inhibit the electrodes from achieving their theoretical maximum EASE. Poor wettability would lead to non-ideal EASE signal strength due to air bubbles that become trapped in the wrinkled structure inhibiting the contact of the sample chemical with the entire surface area of the electrode.

The presented invention modifies the surface of the electrodes by adding a layer of dissolvable polymer coating that prevents air pockets from forming when the sample chemical comes into contact with the sensor. Over time the water soluble polymer will degrade and the sample solution will come into contact with functionalized aptamers residing on the gold electrodes.

SUGGESTED USES

Point of care diagnostics for protein biomarkers as a measure of cancer therapy efficacy, glucose biosensors, and detecting infectious pathogens.

ADVANTAGES

Advantages include the low-cost and ease of manufacturing, which would allow the sensors to be readily used in developing regions of the world as a point of care diagnostic. Another advantage is the increased electrode electrochemical active surface area, which increases the signal to noise ratio.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20180113123	04/26/2018	2017-189

LIMITATIONS

A lengthy or non-standard sensing time may be a limitation of the present technology due to the unknown degradation parameters of the water soluble polymer to expose aptamer coated surface.

STATE OF DEVELOPMENT

The inventor has established a proof of concept for this invention.

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