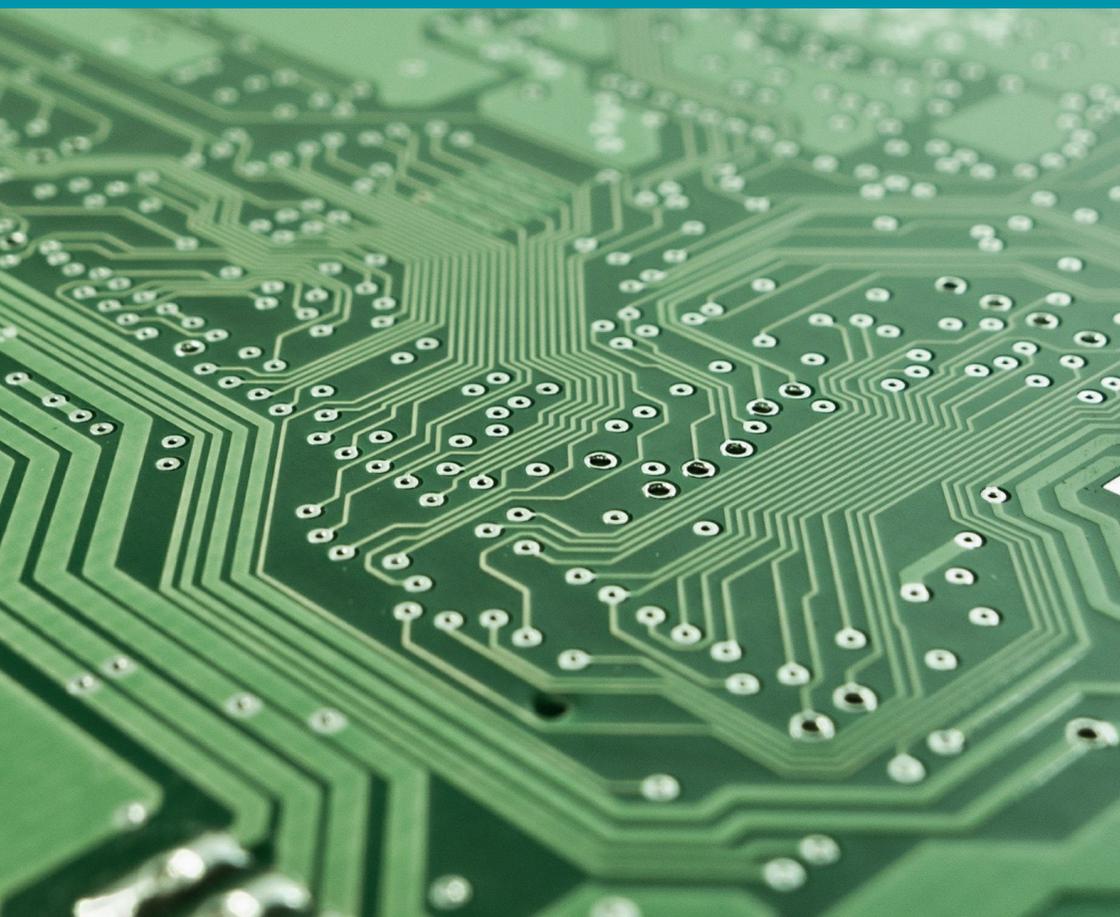




# ELECTROPLATED MICROELECTRODES

For high-sensitivity, label-free electrochemical biosensing platforms



## TECHNOLOGY

The University of Bath, UK has patented a technique to miniaturize highly sensitive electrodes for label-free electrochemical detection of biomarkers. Researchers from the University of Bath have developed a way to precisely control the surface roughness and purity characteristics of electroplated microelectrodes which addresses the major fabrication problem involving the assembly of molecular moieties onto conductive electrodes. This method allows the cost-effective mass-manufacturing of highly sensitive microelectrodes to be successfully exploited for redox-labelled electrochemical biosensing assays<sup>1</sup>.

## BACKGROUND

There are many different experimental methods used for the electrochemical detection of a target species (i.e. an analyte) in a liquid sample. Such methods typically involve the measurement of a change in the electrical properties of measurement apparatus when the target species undergoes a redox reaction at a working electrode in contact with the liquid sample. Electrochemical impedance spectroscopic methods involve measurement of the changes in capacitance or charge-transfer resistance which occur when a target species undergoes a redox reaction at a working electrode. Such methods have been shown to be suitable for the electrochemical detection of biological molecules (e.g. biomarkers) in liquid samples due to extremely high accuracy.

Specifically, they can demonstrate the unique advantage of reagent- and label-free detection, when combined with an assay employing the immobilization of redox-modified peptides at a sensing electrode surface. However, although such measurement methods are accurate, their use outside research laboratories has until now been restricted by the assumed requirement for high-quality, macroscopic, or miniaturized gold disc electrodes which are either too large to enable integration into commercial diagnostic cartridges or too expensive for mass production of such commercial diagnostic cartridges.

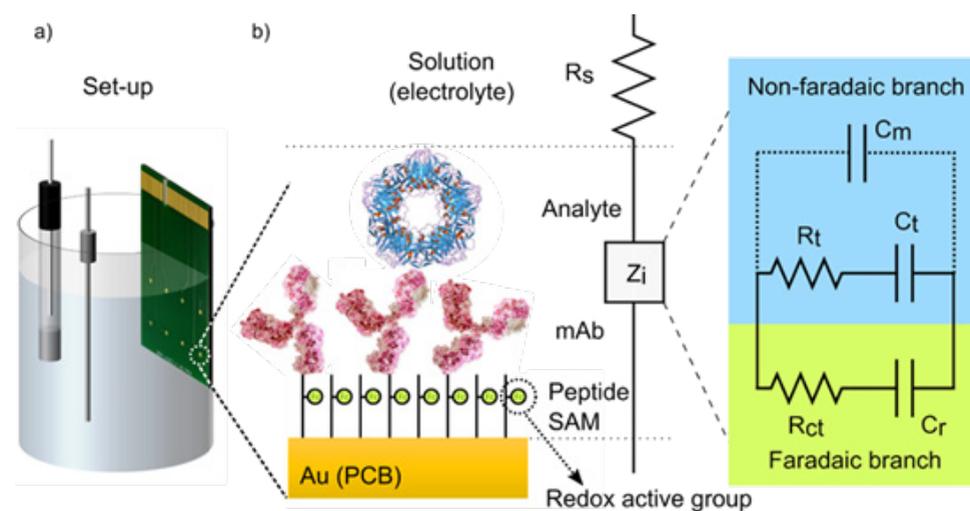
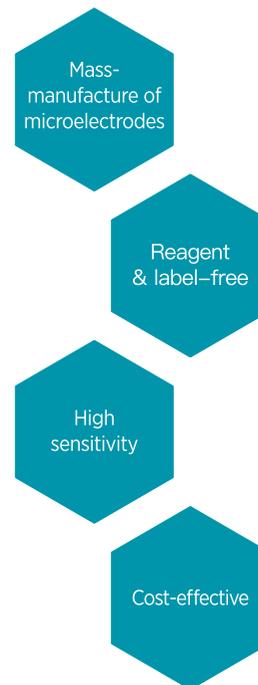
<sup>1</sup> Dutta et al. Impact of surface roughness on the self-assembling of molecular films onto gold electrodes for label-free biosensing applications. *Electrochimica Acta*, 2021.

## BENEFITS

- Cheap and easy to manufacture
- Miniaturized electrode surfaces
- Label-free
- Reagent-free
- Highly sensitive
- Electrochemical impedance-based
- Seamless integration into Lab-on-Chip microsystems

## COMMERCIAL APPLICATIONS

- Rapid laboratory analytics: substitute for ELISA-based analysis
- Protein detection for infectious disease diagnosis and monitoring: SARS-CoV-2, Chagas, Dengue, sepsis
- Protein quantification for non-communicable disease companion diagnostics: prostate cancer
- Environmental monitoring: water contamination detection
- Food industry: rapid quality control of perishable goods like contamination in dairy, infections in chickens farms etc.
- Veterinary applications: rapid antidoping detection in horses, antibiotic reduction in farm animals



Measurement set-up and the equivalent circuit:

a) Visual representation of the used set-up with Printed circuit board (PCB) electrodes immersed into a beaker containing platinum wire counter and Ag/AgCl(KCl) reference electrode. b) Schematic representation of the electrode surface covered with electroactive peptide SAM, equipped with mAbs and correlating equivalent circuit.

## CONTACT

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The University of Bath are looking for partnerships to help develop this technology for a variety of sectors. If you are interested to discover more then please get in contact.

### TECHNICAL

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