CREATING A **DIMENSION** OF INFINITE **POSSIBILITIES**

UNIVERSIDADE DE VIGO

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COMMERCIAL APPLICATIONS
RAPID, LOW-COST CELL ANALYSIS
USING GOLD NANOPARTICLES

- **MEDICAL DIAGNOSTICS**
- **ENVIRONMENTAL MONITORING**
- **FOOD QUALITY MONITORING**
- **SAFETY AND SECURITY**

ELECTROCATALYTIC QUANTIFICATION OF GOLD NANOPARTICLES FOR CELLS ANALYSIS AND OTHER APPLICATIONS - PCT/ES2009/070489

ICN ARBEN MERKOÇ I ALFREDO DE LA ESCOSURA-MUÑIZ I ADRIANO AMBROSI I MARISA MALTEZ I **UNIVERSIDAD DE VIGO** ÁFRICA GONZÁLEZ-FERNÁNDEZ I CHRISTIAN SÁNCHEZ-ESPINEL I BELÉN DÍAZ-FREITAS

A system for the rapid identification of tumour cells has been developed, consisting of a rapid and sensitive electrocatalytic method to quantify gold nanoparticles (AuNPs) coupled with a new electro-transducing platform/sensor.

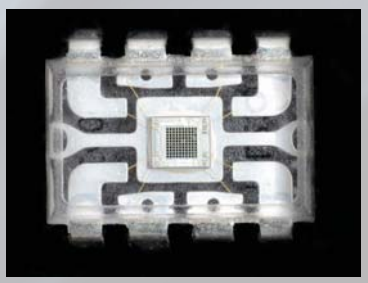
The platform consists of a screen-printed carbon electrode (SPCE) that allows cell proliferation on its surface followed by in-situ detection/identification. Identification is based on the specific conjugation of the target cells with activated AuNPs, and their quantification via a catalytic reaction that produces hydrogen. The system avoids the use of chemical agents used in existing assays, improving the time and simplicity of the assay. In-situ cell proliferation further reduces analysis time and allows miniaturization and easy application of the system.

BACKGROUND

The most common method to date for the detection and quantification of AuNPs in affinity assays has been indirect detection following chemical dissolution of the AuNPs.

In recent years, direct detection of AuNPs avoiding the use of chemical reductors have been proposed, including electrochemical techniques such as: differential pulse polarography (DPP), anodic stripping differential pulse voltammetry (DPASV), square wave voltammetry (SWV) and potentiometric stripping analysis.

However, despite the inherent high sensitivity of these methods, different strategies have been proposed to improve the sensitivity of the bioassays based on AuNPs as labels.

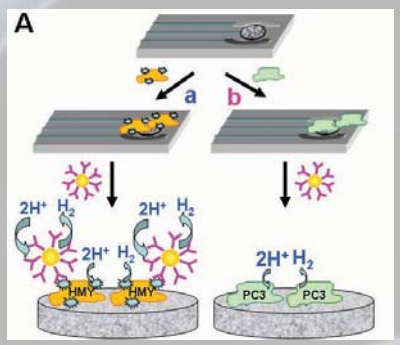


RESEARCH RESULTS

The AuNPs quantification method is based on the catalytic effect of the AuNPs on the reduction of hydrogen ions to hydrogen on the surface of carbon electrodes, allowing for an indirect determination of the AuNP concentration.

The method is described for SPCE transducers, but can be extended to other electrochemical transducers. The catalytic method is based on the fact that the presence of AuNPs in a solution containing hydrogen ions (a chlorhydric acid solution) shifts the hydrogen ions reduction potential towards less negative potentials.

Furthermore, due to the catalytic effect of the AuNPs, a greater anodic current is generated at a fixed reduction potential. Thus, at a fixed potential, the intensity of the current recorded during electroreduction of hydrogen ions can be quantifically related to the presence or absence of AuNPs on the electrode surface.



Schematic description of the procedure used for cell identification. (a) HMY cells - tumoral B cell line that express DR surface proteins - and (b) PC3 cells - tumoral prostate cell line that do not express DR surface proteins- have grown on the SPCE surface, identified with AuNPs/Anti-human-DR and detected using the electrocatalytic method.

COMMERCIAL APPLICATIONS

The novelty of the cell identification / quantification method proposed consists in performing simultaneously the cells grown on the surface of the electrochemical transducer followed by their later detection/identification in situ, using specific antibodies conjugated to AuNPs and their rapid detection based on the catalytic method.

This new method of cell identification can be extended for quantification purposes, using a rapid, simple, miniaturized and low cost system. Potential applications are varied, including the detection of cancer or inflammatory cells in diagnostic procedures.

PUBLICATIONS

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CONTACTS: SCIENCE - ARBEN MERKOÇI – ARBEN.MERKOCI@ICN.CAT | AFRICA GONZALEZ – AFRICA@UVIGO.ES |
COMMERCIAL DEVELOPMENT - JORDI REVERTER – JORDI.REVERTER@ICN.CAT
INSTITUT CATALÀ DE NANOTECNOLOGIA. CAMPUS DE LA UAB, EDIFICI CM7, 08193 BELLATERRA, ESPAÑA | TEL: +34 93 581 4408 | WWW.ICN.CAT
UNIVERSIDADE DE VIGO. CAMPUS LAGOA MARCOSENSE, S/N 36.310 VIGO, ESPAÑA | TEL. +34 98 681 2625 | WWW.UVIGO.ES

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