Poster

ENHANCED ELECTROCHEMICAL IMMUNOASSAY BASED ON PARAMAGNETIC PLATFORMS AND GOLD NANOPARTICLE LABELS

Adriano Ambrosi,[†‡] *Anthony J. Killard,*[†] *Malcolm R. Smyth,*[†] *Salvador Alegret*[¥] *and Arben Merkoçi*[‡*]

[†]*School of Chemical Sciences, Dublin City University, Dublin 9, Ireland*
[‡] *Nanobioelectronics & Biosensors Group, Institut Català de Nanotecnologia, Campus UAB, Bellaterra, Catalonia, Spain*
[¥] *Grup de Sensors i Biosensors, Departament de Química, Universitat Autònoma de Barcelona, Bellaterra, Catalonia, Spain*
*E-mail: Arben.Merkoci.icn@uab.cat

Gold nanoparticles (AuNPs) have been used for analytical and biomedical purposes for many years. Rapid and simple chemical synthesis, a narrow size distribution and efficient coating by thiols or other bioligands has enabled gold nanoparticles to be used as transducers for several biorecognition binding applications.

The combination of biomolecules with AuNPs provides interesting tools for several biological components. Oligonucleotide functionalized gold nanoparticles, have become the basis for an increasing number of diagnostic applications that compete with molecular fluorophores in certain settings.[1] The use of AuNPs for protein analysis is also a very interested research field. AuNP/protein conjugates are finding increasing application as biochemical sensors, enzyme enhancers, nanoscale building blocks and immunohistochemical probes.[2,3]

Nanoparticles in general and AuNPs particularly offer attractive properties to act as DNA tags.[4] Their sensitivity, long life-time along with multiplexing capability have led to an extensive applications in electrochemical assays in recent years.[5] However, most of the reported assays were based on chemical dissolution of AuNP tag (in a hydrobromic acid / bromine mixture) followed by accumulation and stripping analysis of the resulting Au^{3+} solution.

In this work, a sensitive, direct electrochemical detection of AuNP labels using streptavidin-modified paramagnetic beads as immobilization platform is presented. A sandwich immunoassay system with biotinylated goat anti-human IgG primary antibody specific to human IgG and gold-labelled anti-human IgG secondary antibody, was exploited to attach AuNPs to the magnetic beads. High sensitive electrochemical stripping analysis was performed to directly quantify the specifically captured metal without the dissolution step by means of toxic and dangerous acids. A tiny magnet incorporated inside the graphite epoxy composite electrode (GECE-M) considerably enhanced the adsorption of gold on the electrode surface hence improving the sensitivity and limit of detection. A comparison with the classical spectrophotometric methods (ELISA) using peroxidase(HRP)-labelled antibodies was also performed.

References:

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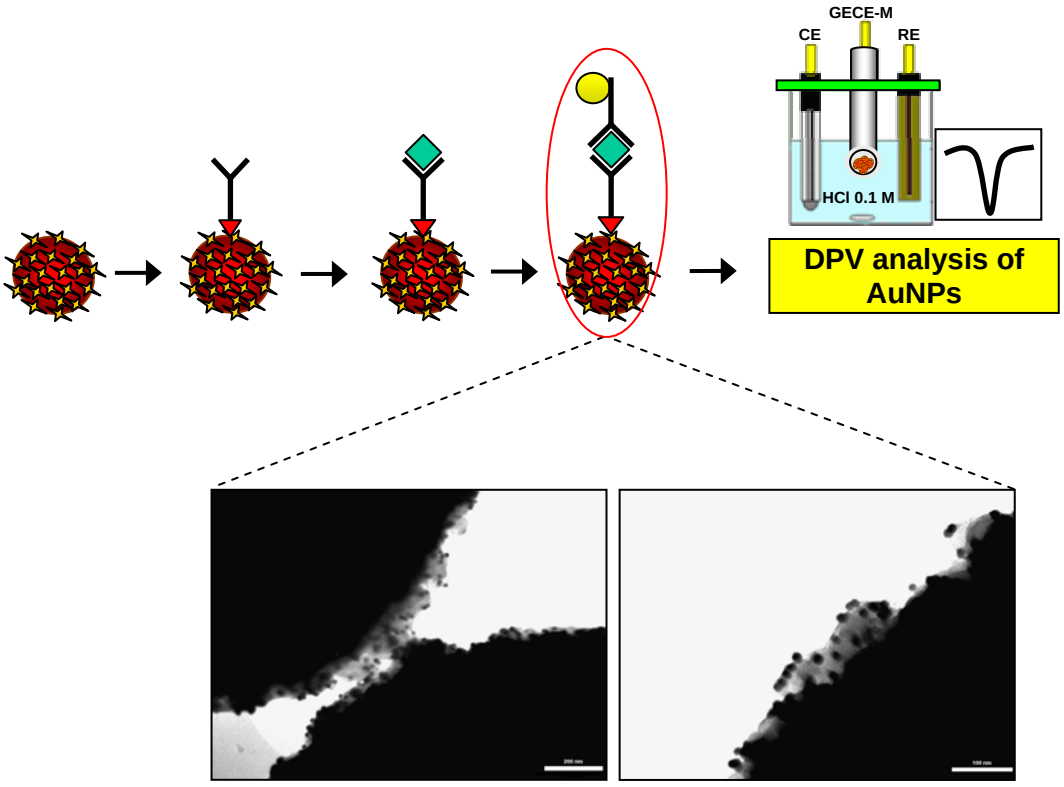

Figure: Schematic of the electrochemical assay based on magnetic particles and further DPV detection. Shown (lower part) are TEM images of magnetic particles linked with AuNPs through the sandwiched immunocomplex.