IDF INNOV

De l'invention à l'innovation

# ELECTROCHEMICAL ATOMIC FORCE MICROSCOPY PLATFORM

AFM-SECM : nanoscale correlative electrochemical imaging for simultaneous topographic and functional characterization of redox nano-objects.

Electrochemistry ▪ Atomic force electrochemical microscopy ▪ AFM-SECM ▪ *In situ* nanoscale imaging ▪ Nanoparticles ▪ Viral particles ▪ Biomacromolecules

## SCIENTIFIC EXPERTISE

- High resolution correlative imaging of single redox nano-objects
- Fabrication of metallic (*functionalizable*) combined nanoelectrode - AFM probes
- Redox labelling of nano-objects (nanoparticles, viruses, proteins, etc.)

## APPLICATIONS

- Biotechnology (biosensors, biochips, biocatalytic systems)
- Viral Nanotechnology (nano-vectors, nano-reactors, etc.)

## TRACK RECORD

- Characterization of individual PEG functionalized gold nanoparticles . [1]
- AFM-SECM mapping of nano-dots of redox immunomarked proteins. [2]

## PUBLICATIONS

[1] K. Huang & al. ACS Nano 2013, 7, 4151–4163

[2] A. Anne & al. Anal. Chem. 2011, 83, 7924–7932

## CONTACT

Mail : bd-services@idfinnov.com

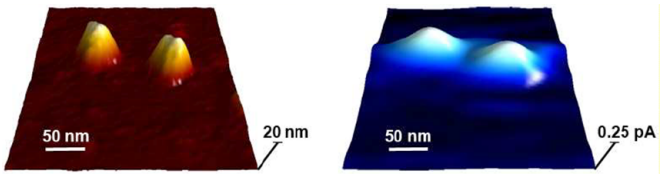
Phone : +33(0)1.80.05.65.01

## SERVICE DESCRIPTION

The research group proposes a high resolution electrochemical imaging platform for *in situ* functional probing of individual redox or redox labeled nano-objects (nanoparticles, (bio)-macromolecules, viral particles…) immobilized on a surface.

For this, the group has developed an original imaging technology coupling atomic force (AFM) and electrochemical (SECM) microscopies and enabling the simultaneous acquisition of topographic and electrochemical images with a nanometer resolution. This coupling is made possible by the use of metal nanoprobes (nanoelectrodes) produced by the group following an original process.

AFM-SECM microscopy thus offers the possibility of correlating different properties (topographic, redox or catalytic) measured for the same individual nano-object. It is free of the limitations of other nano-characterization imaging techniques such as XRD, TEM and AFM which are either ex-situ, nonspecific and/or purely topographic methods. Development of AFM-SECM is therefore an important technological leap toward functional analysis of nano-objets at the macromolecular scale.




*Simultaneously acquired topography (left) and current (right) AFM-SECM images of two ~20 nm gold nanoparticles functionalized by redox-labeled PEG chains. The current image allows the polymeric (PEG) coating of the nanoparticles to be visualized. (©Université Paris Diderot)*

## OFFERS

We offer, via collaborative mid or long term research contracts (3 months min.), to design experimental strategies allowing AFM-SECM correlative imaging of redox (bio)-nanostructures immobilized on a surface, in the framework of (bio)-nanotechnology applications.