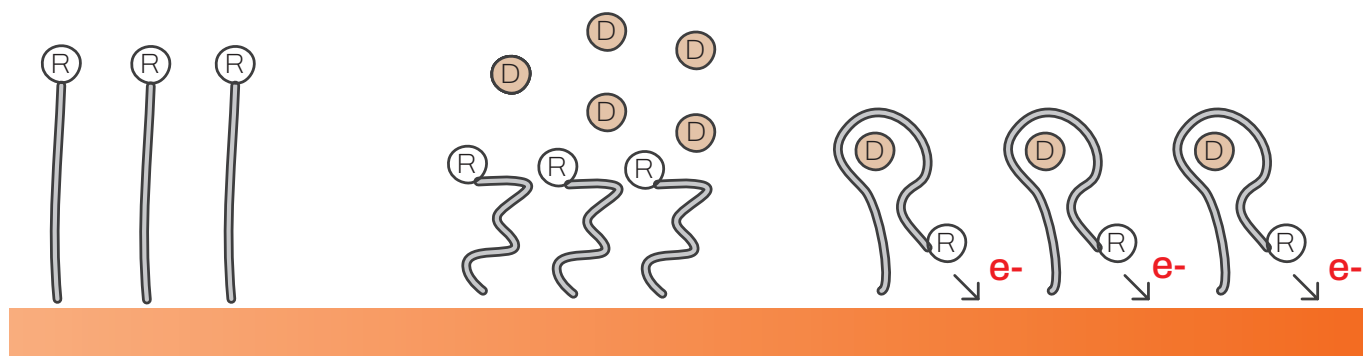




INTEGRATING ELECTROCHEMICAL AND MP-SPR MEASUREMENTS

Multiple electrochemical methods, such as potentiometric, amperometric or impedance spectroscopy can be applied



Key benefits of EC MP-SPR

The combination of Multi-parametric surface plasmon resonance (MP-SPR) and electrochemistry (EC) offers a powerful analytical toolset for a wide range of applications spanning from fundamental research to industrial and environmental monitoring.

Extremely high sensitivity combined with real-time and label free measurement capabilities of MP-SPR provides unparalleled possibilities when integrated with electrochemistry. Electrode processes can be followed with EC and SPR simultaneously, such as ion exchange, electrode potential change and electrodeposition. Particularly useful are deposition processes, such as electrochemical electrodeposition of polymers and metals. Such processes can be applied to the study of rechargeable batteries and electrochemical biosensors.

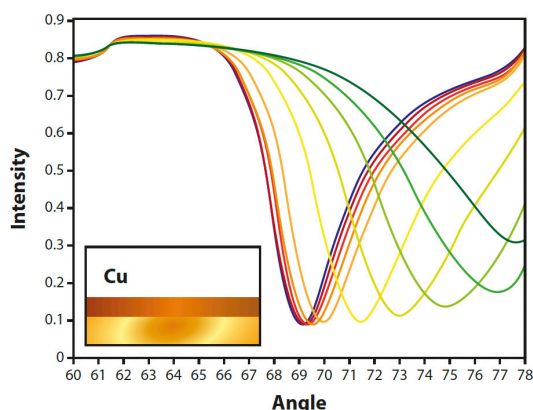
KEY QUESTIONS MP-SPR CAN ANSWER IN ELECTROCHEMISTRY RESEARCH:

- How fast does protein X adsorb onto surface A?
- How does the reaction change at different temperature, pH and electric potential?
- How fast is the electrodeposition?
- How fast is the catalysis?
- How the electrical biosensors behaves in response to analyte binding?

WHY CHOOSE EC-MP-SPR COMBINATION?

Electrochemical (EC) measurement integrated with Multi-Parametric Surface Plasmon Resonance (MP-SPR) measurements gathers both optical and electrochemical data simultaneously from the same sensor surface. Multiple electrochemical methods, such as potentiometric, amperometric or impedance spectroscopy can be applied. Along with EC measurement, MP-SPR measures binding affinity, kinetics, mass, layer thickness, and refractive index.

The MP-SPR instrument works with glass sensor slides coated with a metal layer, most often utilizing a gold coating. MP-SPR sensor slide works as working electrode in the measurement and can be easily cleaned *ex situ* using plasma cleaning or Piranha wash as required with high precision experiments. Also *in situ* electrochemical cleaning, by potential cycling in an optical medium, can be applied.



Copper deposition and stripping processes under constant current (galvanostatic) conditions. Copper layer thickness is calculated with LayerSolver software fitting complete SPR curves. AN#142

Application areas:

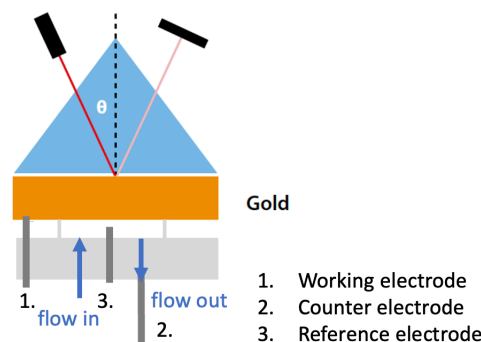
Material Science and Surface Chemistry: Investigate surface properties such as molecular adsorption kinetics and conformation changes. Measure electrodeposition and stripping on a sensor surface in real-time.

Electrochemical Energy Storage: Characterize electrode materials, electrolytes, and interfaces to aid in the development of advanced energy storage systems such as batteries.

Biosensing: Highly sensitive detection of biomolecules for medical diagnostics and biotechnology, including studying kinetics and affinity constants. Measures electro-switchable reactions effectively.

Environmental Monitoring and Food Safety: Detect and quantify pollutants such as heavy metals using anodic stripping voltammetry. Ensure food safety through the sensitive detection of foodborne pathogens.

Nanotechnology and Nanomaterials: Understanding the surface interactions and electrochemical properties of nanoparticles and nanocomposites is crucial for applications in electronics, catalysis, and nanomedicine.



MP-SPR measurement combined with simultaneous electrochemistry measurement. Gold sensor surface works as a working electrode.

Electrochemical add on module for every application:

Kinetic Electrochemistry flow cell - SPR328-EC2

- With two channels and a small volume for rapid changes of liquid media
- The MP-SPR signal is measured from both flow channels simultaneously, while the electrochemistry signal is measured from one of the two channels
- Compatible with 2-channel MP-SPR Navi™ instruments 200 OTSO, 210A VASA and 220A NAALI

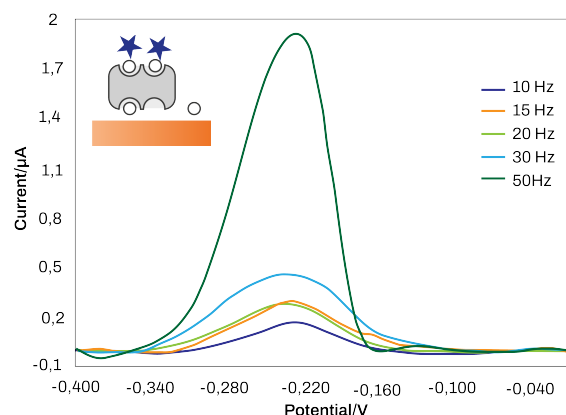
Electrochemistry Cuvette - SPR321-EC

- One chamber facilitates two individual and simultaneous MP-SPR measurements, along with the acquisition of one electrochemistry signal
- Compatible with all (2 and 4 channel) MP-SPR Navi™ instruments

Custom made - e.g. Large Volume Cuvette

- Ask more about availability and compatibility for your instrument

Electrochemistry flow cells are add-on modules available for all BioNavis MP-SPR instruments. Connect electrochemistry flow cell to your potentiostat or purchase one from BioNavis.



Square wave voltammetry (SWV) graph showing current responses at different applied frequencies coming from oxidation of immobilized biotinylated methylene blue. AN#173

Further reading

AN#173 Electrochemical Oxidation of Immobilized Methylene Blue

AN#142 Metal electrodeposition

Selected publications

Study of physiochemical properties of Thiadiazoles (David *et al.*, European Biophysics Journal, 2021)

Glucose biosensors on graphene - oxide film (Juan *et al.*, ACS Omega, 2023)

Evaluation of HepG2 cell attachment to extracellular matrix (Xhang *et al.*, Journal of Colloid and Interface Science, 2021)

