BioNavis

SEE BEYOND THE SURFACE

Multi-Parametric Surface Plasmon
Resonance **For Material Sciences**

www.bionavis.com

MP-SPR APPLICATIONS

Unlock the potential of Multi-Parametric Surface Plasmon Resonance (MP-SPR) technology, a powerful tool tailored for the evolving needs of **material science**. MP-SPR delivers precise and comprehensive measurements across a wide range of applications – from polymers and nanoparticles to advanced coatings, thin films, and complex hybrid materials. Whether you are optimizing surface properties, characterizing thin-film coatings, studying material interactions, or evaluating mechanical and optical properties, MP-SPR provides the accuracy and versatility to elevate your research and development.

Nanoparticles

Whether you develop metal, silica, polymer or other nanoparticles, MP-SPR is an excellent choice for nanoparticle characterization. Get your "before and after" images with SEM or AFM. See the dynamics of self-assembly, targeting, release or internalization in real-time with MP-SPR!

Electrochemistry

Multiple electrochemical methods such as potentiometric, amperometric or impedance spectroscopy can be coupled to MP-SPR. This enables simultaneous monitoring of (electro)chemical reactions at the surface, label-free and in real-time.

Sensor development

MP-SPR can be used to fine-tune sensitive coatings for specific gas or liquid components. Amongst others, MP-SPR is able to detect hydrogen (2 Dalton) on Palladium surface, cancer cells on a targeted surface, bacteria in drinking water, α-Lactalbumin in milk, or cocaine in saliva. MP-SPR is used for development and validation of point-of-care assays as well as for testing of the materials for microfluidic handling of the samples.

Softmaterials

MP-SPR measures interactions to polymers from ultrathin films up to 20 µm thick films. MP-SPR is the most sensitive label-free technique for biomaterial interaction studies and layer characterization. MP-SPR assists optimization of barrier layers, including moisture, pH, antireflective, antifouling and antibacterial coatings.

Nanocellulose

MP-SPR enables label-free analysis of nanocellulose interactions, from molecular adsorption to structural changes, without water interference. It supports studies on dispersibility, self-assembly, enzymatic degradation, and protein or cell interactions with nanocellulose. MP-SPR also provides insights into environmental effects, such as vapor-induced swelling. With high sensitivity and real-time monitoring, MP-SPR assists in optimizing nanocellulose-based materials for biomedical, coating, and composite applications.

Thin solid films

Solar cells, displays, food packaging, anticorrosive, antimicrobial, antireflective functional coatings - MP-SPR helps to reduce the coating thickness while maintaining the functionality. MP-SPR allows measurements of interactions as well as plasmonics, thickness and complex refractive index of ultrathin metal coatings from 3Å to 100 nm.

SENSOR SLIDES

Easy to use sensor slide holder allows you to customize your sensor using methods such as spin coating, CVD, Langmuir-Blodgett, self-assembly or other techniques of your preference or select from a wide range of ready sensor slides

✓ Metals – Au, Ag, Pt, Cu, and other options

✓ Oxides - SiO_2, TiO_2, Al_2O_3, and other options

✓ Polymers - PS, PMMA, PS-PMMA, nanofibrillar cellulose (NFC) and other options

✓ Uncoated glass for metal depositions

✓ Functionalized sensor slides - CMD, BND, Regenerable avidin kit, his-tagged binding (Ni^2+), and other options

WHY CHOOSE MP-SPR?

Unlock the full potential of material science research with MP-SPR. Its versatility enables precise analysis across **diverse sample types and environments**, while delivering comprehensive parameters for deeper insights. Take your research further by seamlessly integrating MP-SPR with techniques like electrochemistry or fluorescence for enhanced data richness and innovation.

Advantages of MP-SPR

- ✔ Thickness characterization, from Ångströms to several micrometers

- ✔ Thickness and refractive index determined simultaneously

- ✔ Enables tracking of material swelling in dry-to-wet transitions

- ✔ MP-SPR serves as an at-line validation tool for thin film deposition (e.g., CVD, ALD)

- ✔ Adsorption kinetics and bound mass on surfaces

- ✔ Measures material-solvent interactions

- ✔ No vacuum required—measurements are completed within minutes

- ✔ Wide range of ready sensor slides or coat your own

- ✔ Easy sensor handling with an elastomer-coated prism allowing validation with microscopy, SEM, AFM
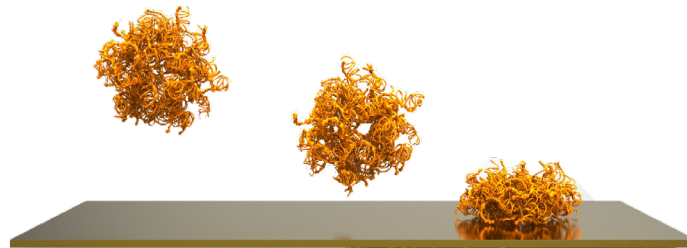
> "It is essential for us to decouple the contribution of hydration and bound water for quantification of adsorbed mass, layer thickness, etc."
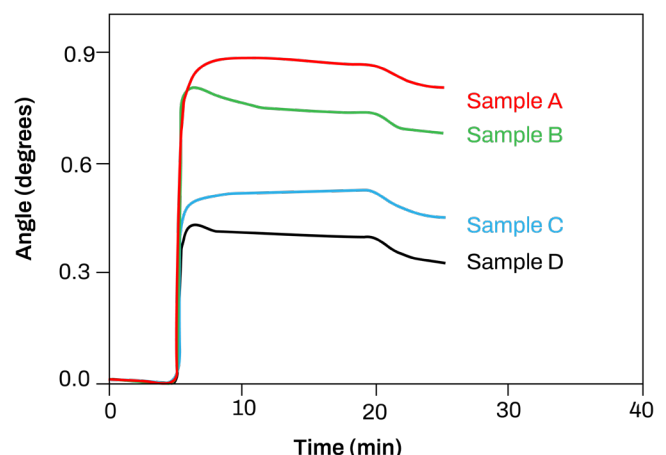>
> **Prof. Orlando Rojas, University of British Columbia, Canada, and Aalto University, Finland**

Complete SPR curves
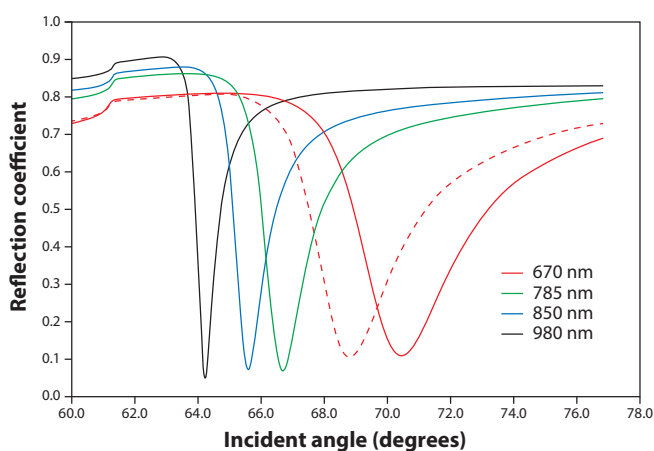
Complete SPR curves are measured simultaneously with four wavelengths and are fitted to determine layer properties, such as **thickness** and **refractive index** using dedicated LayerSolver™ software.

MP-SPR Sensogram

Binding kinetics and adsorbed mass measured by MP-SPR. Binding behaviour of molecules can be evaluated.

MP-SPR TECHNOLOGY

Unlock comprehensive material insights with MP-SPR's advanced platform. Its state-of-the-art optical design and adaptable fluidics enable precise measurement of **layer properties and surface interactions** across diverse materials.

From drug discovery to Ångström precision in coatings and material development

While Surface Plasmon Resonance (SPR) has been established for more than 20 years in drug discovery, BioNavis has further developed and optimized the technology for material research. Multi-Parametric Surface Plasmon Resonance (MP-SPR) measures surface interactions on metals and dielectrics, including cellulose, SiO_2, Ag, Pt, ceramics as well as graphene. Apart from kinetics, MP-SPR can determine thickness and refractive index of thin films from a few Ångströms up to microns.

The key to the MP-SPR is the scanning measurement of complete SPR curves at multiple wavelengths providing unique dataset including total internal reflection (TIR) and peak minimun angle (PAP) and intensity (PMI). When measured as a function of time, the results can be calculated to many different physical parameters describing sample properties or interactions.

What can you measure with MP-SPR?

Molecular interactions	Layer properties
Kinetics (k_a, k_d)	Refractive index (n)
Affinity (K_D)	Thickness (d)
Concentration (c)	Density (ρ)
Adsorption/Absorption	Surface coverage (Γ)
Desorption	Swelling (Δd)
Adhesion	Extinction coefficient (k)
PureKinetics (k_a, k_d, K_D, c)	Optical dispersion (n(λ))
Electrochemistry (E, I, Z (ω)) Fluorescence	

Working principle:
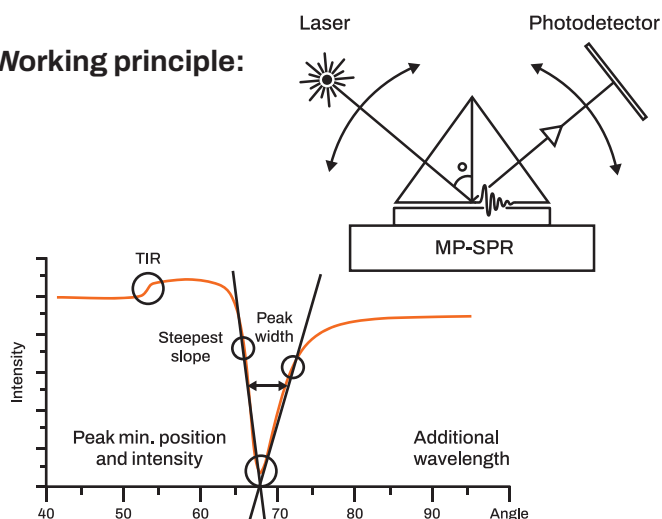
The method is able to detect even subnanometer changes at the surface as the resonance angle shifts. These measurements can then be converted into thickness, refactive index, absorption, and surface coverage. The technique measures the values over time and can thus provide also dynamic measurements such as adsorption kinetics, swelling, release of material and other.

LayerSolver™ : True thickness of layers

Typically, refractive index has to be assumed from literature, however, for nanolayers, such refractive index (RI) is unfortunately not sufficiently close to the real value. RI varies for different deposition methods, material composition, moisture, electric field, etc. Hence, for precise thickness (or true thickness) determination, RI has to be determined as well. MP-SPR measures at multiple wavelengths which enables resolving both thickness and refractive index at the same time.

> "The fact that the BioNavis instruments acquire the full angular spectra, including the total internal reflection angle in both air and liquids, is absolutely essential for our research on characterizing polymer brushes and other thin hydrated films."
>
> **Prof. Andreas Dahlin, Chalmers University of Technology, Sweden**

MP-SPR NAVI™ INSTRUMENTS

384- or 96-sample automation

MP-SPR Navi™
220A NAALI

6-sample automation

MP-SPR Navi™
210A VASA

Semi-automated

MP-SPR Navi™
200 OTSO

All of our MP-SPR instruments are designed and manufactured in Finland. To honor the Finnish roots of our products, we named our instruments after Finnish wild animals. For example, our 'NAALI' instrument, named after the Finnish word for arctic fox.

Model

Model	MP-SPR Navi™ **220A NAALI**	MP-SPR Navi™ **210A VASA**	MP-SPR Navi™ **200 OTSO**
Number of fluidic channels	2	2	2
Autosampler for liquids	96 and 384 well plate, 6-vials	6-vials	–
Unattended run	●●	●	–
Sample requirement partial/ full loop injection	70µL / 300µL	70µL / 300µL	– / 500µL
Minimum injected volume	50 µL	50 µL	50 µL
Buffer degasser	●●●	●●●	Opt. (●●)
Compatibility with organic solvents	Opt. (●●●)	●●●	Opt. (●●)

Functionality

Sensitivity	●●●	●●●	●●●
Kinetics and affinity characterization	●●●	●●●	●●
PureKinetics™	●●●	●●●	●●●
Concentration analysis	●●	●●	●●
Thermodynamic analysis	●●	●●	●●
Thickness and refractive index characterization	●●●	●●●	●●●
Living cell measurements	●●	●●●	●●
Electrochemistry measurements	Opt. (●●)	Opt. (●●●)	Opt. (●●●)
Fluorescense measurements	Opt. (●)	Opt. (●●)	Opt. (●●)
Choose additional lasers (-L): 2-4 wavelengths / flow channels	●●●	●●●	●●●
Sensor slide range	Au, Ag, Cu, SiO$_2$, Al$_2$O$_3$, PDMS, Regenerable avidin kit, Carboxymethyl dextran		

MP-SPR Software

TraceDrawer™: Affinity, concentration and kinetics	●●●	Opt. (●●●)	Opt. (●●●)
LayerSolver™: Thickness and complex RI (refractive index)	Opt. (●●●)	●●●	Opt. (●●●)
Control and DataViewer	●●●	●●●	●●●

●●● Optimal ●● Excellent ● Good

Specifications are subject to change without prior notice.

SERVICES

In addition to instrumentation, BioNavis also offers measurement and testing services on a contract basis. Our experienced team collaborates closely with customers to customize projects according to specific needs.

COMPLEMENTARY QCMD

BioNavis product range also includes Quartz Crystal Microbalance with Dissipation (QCMD) instruments for surface-sensitive measurements.

BioNavis

We are here to help you find the best solutions for your research. Get in touch **info@bionavis.com**

www.bionavis.com

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