Excellence in Surface Plasmon Resonance

BioNavis

Multi-Parametric Surface Plasmon Resonance For Life Sciences

See more with MP-SPR!

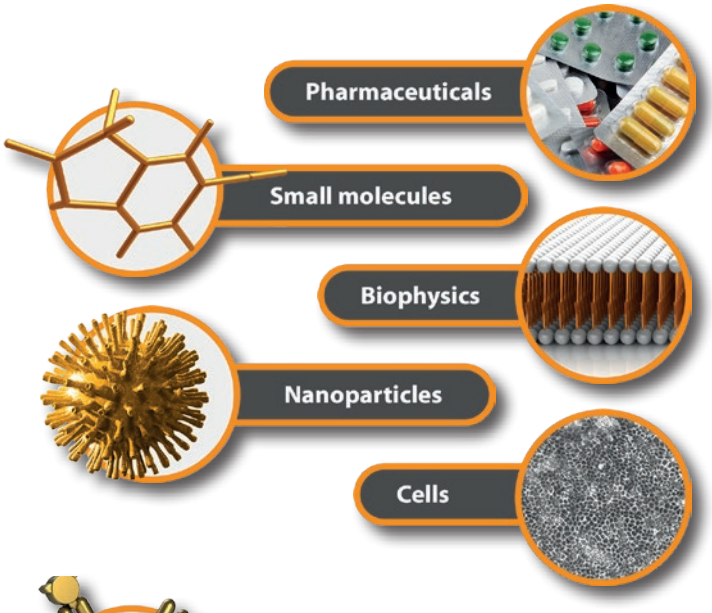
MP-SPR Applications

Pharmaceuticals

The unique PureKinetics™ feature together with a large working range make MP-SPR an essential tool for new challenges posed by the shift from synthetic to biopharmaceutial drugs. From antibody characterization through drug uptake routes, controlled drug release strategies, small molecule measurements, nanoparticle targeting up to drug internalization by living cells, MP-SPR helps you to get ahead of the competition. Make drugs that work *in vivo*!

"MP-SPR allows us to work with living cell monolayers grown directly on the sensor surface or with the aid of e.g. fibronectin and other growth promoting proteins. With MP-SPR, we are able to observe and quantify the differences in cell uptake kinetics of nanoparticles in dependence with the surface characteristics of the nanoparticle and their targeting."

–As. Prof. Tapani Viitala, University of Helsinki, Finland



Antibody characterization

Antibody-antigen interaction affinity and kinetic measurements can be performed in diverse liquids including complex liquids such as 100% serum, urine or saliva.

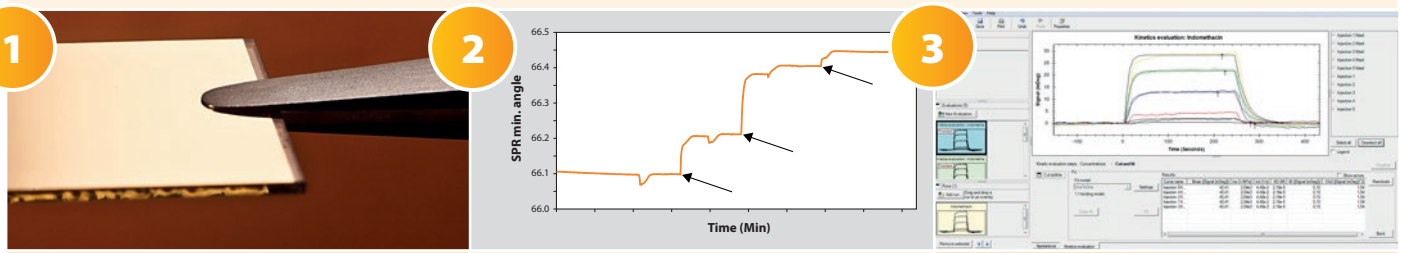
Biosensor development

From nanoparticle-based competitive assays through electrochemical sensors to direct assays, MP-SPR shows all the steps of your assay may you develop it on top of glass, polymer, silica, metal surfaces or nanoparticles!

Biomaterials

MP-SPR measures interactions on polymers up to 5 µm thick. MP-SPR is the most sensitive label-free technique for biomaterial interaction studies and layer characterization. It allows optimization of formulations for controlled drug release, novel coatings for cell and tissue engineering as well as industrial barrier coatings.

Measurement step-by-step



Choose a ready substrate, e.g. CMD, HisTag, Au, Pt, SiO2, PS, PDMS, nanocellulose or make your own using CVD, LB, sol-gel, spin-coating, self-assembly, etc.

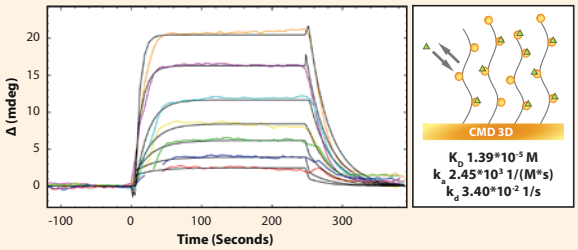
Measure interactions in real-time: on-/off-rates, affinity, adsorbed mass, binding capacity, concentration, etc.

Using TraceDrawer for MP-SPR Navi™, fit measured data with binding models to evaluate affinity(K_D) or half-maximal response (EC50) of the interaction. Multiple fitting models are available including affinity, EC50 and affinity 1:2.

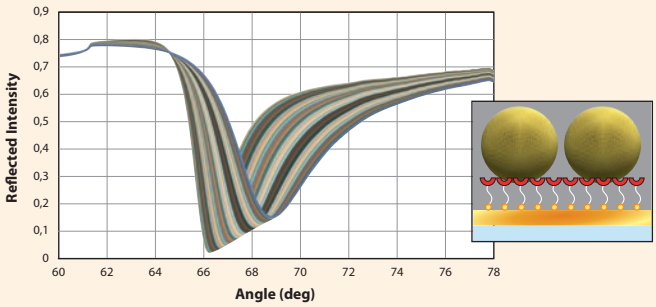
Note: See also our brochure on material science applications!

Why choose MP-SPR?

From small to large molecules: Thanks to PureKinetics™, MP-SPR is a sensitive platform to determine drug-target interactions as well as nanoparticle-target interactions. Label-free interactions are measured in real-time revealing affinity and kinetics of the binding, whether the molecule is small or large.

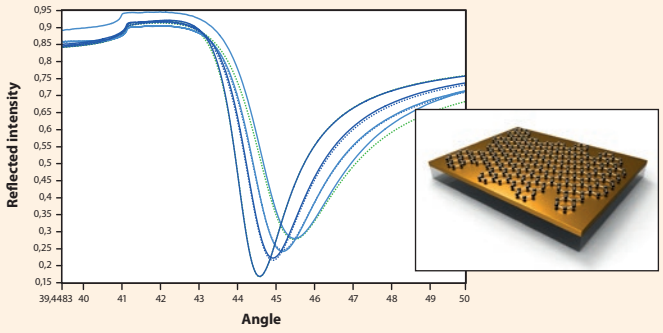


Indomethacin (358 Da) interaction with human serum albumin (HSA). Different concentrations of analyte (colour) are fitted (black curves) using TraceDrawer™ to obtain on- and off-rates as well as affinity.

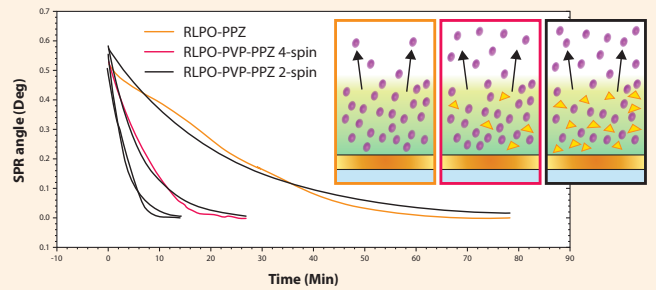


Functionalized gold nanoparticles (50 nm) interacting with a self-assembled polymer layer. Measured at 785 nm.

From Å to µm: Unique wide scanning angular range measurement ensures compatibility not only with thin layers (from Ångströms) but also thicker layers (up to a few micrometers).

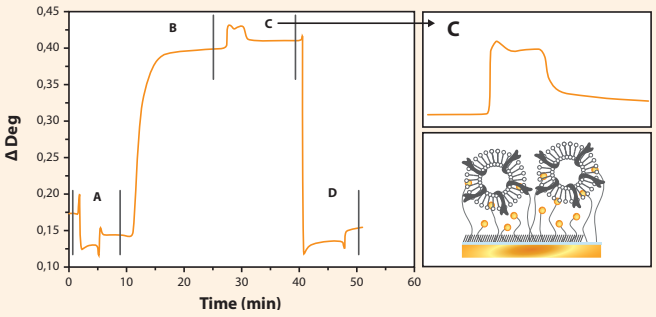


Single monolayer of graphene was measured as 3.5 Å thick at 670 nm wavelength. Thin layers form a single peak in a MP-SPR scan.

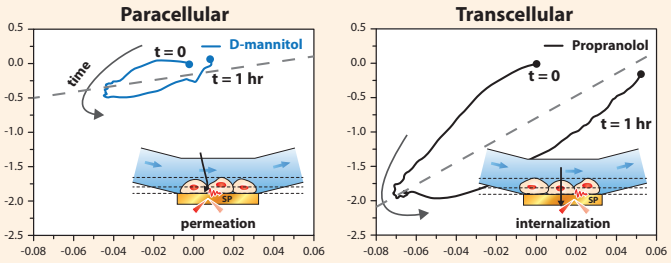


Perphenazine drug release from a micrometers-thick EUDRAGIT® polymer matrix. Faster release rates obtained by adding PVP polymer and varying thickness of the film.

From lipids to living cells: MP-SPR enables to move from drug-target measurements, through drug-membrane interactions all the way to drug-cell interactions.



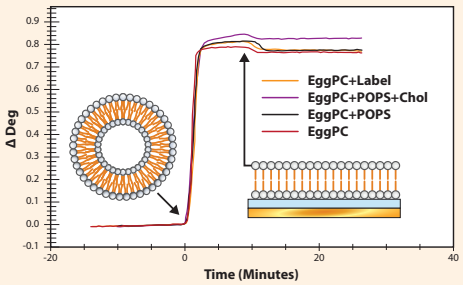
Lipid vesicles are bound to a hydrogel sensor surface and the interaction with a protein is studied. (A) Sensor cleaning injection, (B) Vesicle binding to surface, (C) Protein interaction, (D) Sensor regeneration.

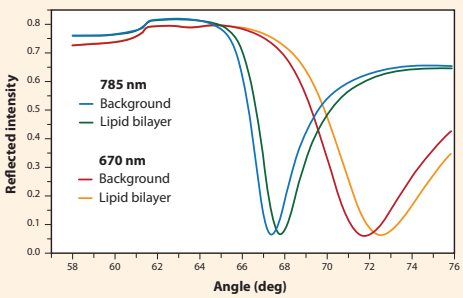


MP-SPR is the first label-free method that differentiates internalization from permeation. MP-SPR can also be used to study cell attachment on different coatings. Cells tested so far include HeLa, MDCKII, A549, LNCaP, ARPE19, PC-3, HepG2, MCF7, BK interacting with small molecules, nanoparticles including liposomes, silica, DNA polyplexes, viruses and microvesicles.

Not only function, but also structure: Thanks to multiple wavelengths and LayerSolver™, MP-SPR helps you to measure biomembrane interaction kinetics as well as underlying structural changes.

MP-SPR enables assessment of the lipid structure on the surface. Thickness and optical density of the layer shed light on the conformation.





Spreading of liposomes into supported lipid bilayers can be observed in real-time.

MP-SPR Technology

From tradition SPR to MP-SPR: From measurements to understanding

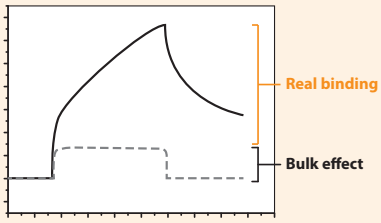
Surface Plasmon Resonance (SPR) is an established method for biomolecular interaction analysis. It is popular due to its sensitivity as well as its capability to measure label-free and in real-time. Multi-Parametric Surface Plasmon Resonance (MP-SPR) is based on SPR principle, however its advantageous optical setup measures a full SPR curve which enables new insight into interactions. For instance, PureKinetics™ feature provides measurements of small molecules, lipids and biomaterials without bulk effect. MP-SPR widens the application range of traditional SPR from small molecules up to nanoparticles and even living cells. Measurements can be performed also in complex media such as serum.

Additionaly, MP-SPR provides information about layer properties. Thickness and refractive index (RI) data can be utilized in material characterization from Ångström thick layers up to micrometers or to ensure conformation of the molecules on the surface.

Premium quality kinetic data with PureKinetics™ (pat.pend.)

Bulk effect (sometimes called DMSO effect, salt or solvent artifact) is the difference in liquid composition between samples and running buffer. The composition difference is seen as a change in refractive index, which in turn appears as a shift in measured SPR curve. In traditional SPR, imaging SPR or localized SPR, only part of the SPR curve can be seen and therefore, several steps have to be taken in order to separate true molecular binding from the undesired bulk effect.

The unique optical setup of MP-SPR instruments enables cross-correlation of parameters provided by the MP-SPR method and allows simple in-line elimination of interfering bulk signal using PureKinetics™ feature. This feature is available in all MP-SPR Navi™ instruments.



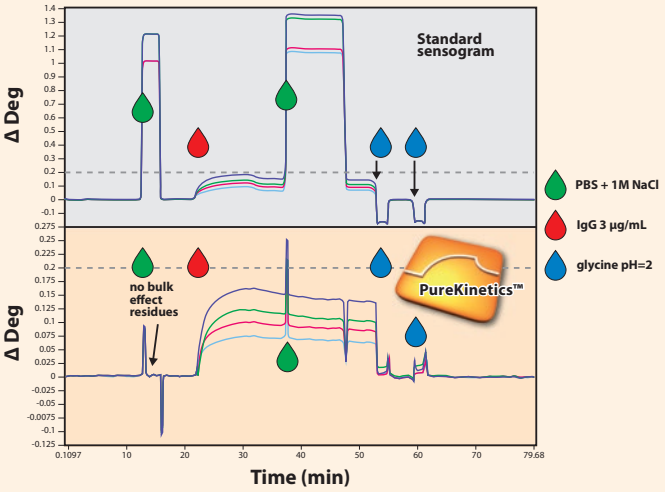
Why is PureKinetics™ the best choice?

- No reference channel needed
- Tolerates even 5% changes in DMSO concentration
- Does not require multiple DMSO injections for calibration

When is PureKinetics™ essential?

Kinetic measurements

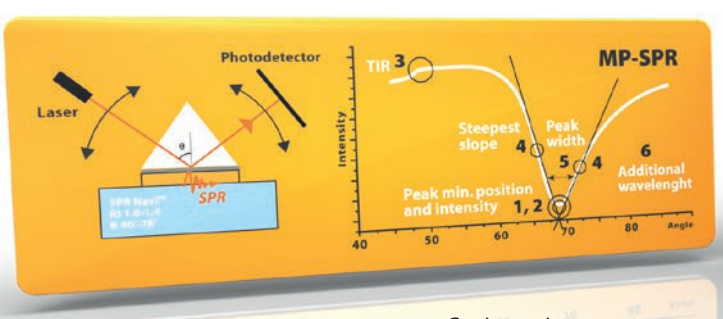
- of small molecules
- on lipid bilayers
- on biomaterials
- in solvents
- in high ion concentration or
- in 100% serum



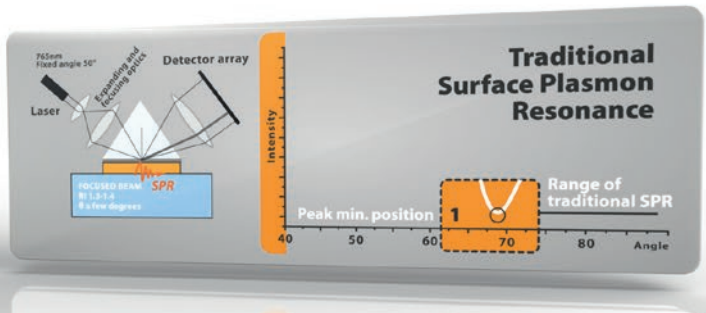
What can you measure with MP-SPR?

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

The table above shows properties that can be measured with MP-SPR and traditional SPR, and those that can be measured only with MP-SPR.



Goniometric arrangement
Typical range
1.0-1.4 of bulk RI
Wide angular range (up to 38 degrees)



Focused beam arrangement
Typical range
1.33-1.38 of bulk RI
10 deg of angular range

MP-SPR Navi™ Comparison

	MP-SPR Navi™ 420A ILVES	MP-SPR Navi™ 220A NAALI	MP-SPR Navi™ 210A VASA	MP-SPR Navi™ 200 OTSO
Number of fluidic channels	4	2	2	2
Autosampler for liquids	96 well plate or 6-vials	96 well plate or 6-vials	6-vials	–
Unattended run	★★★	★★	★	–
Partial loop injections (minimum sample consumption)	★★★	★★★	★★	–
Sample requirementstandard / partial injection	300uL / 80 µL	300uL / 80 µL	350uL / 100 µL	500uL / 100 µL
Minimum injected volume	50 µL	50 µL	50 µL	50 µL
Buffer degasser	★★★	★★★	★★★	(★★)
Compatibility with organic solvents	★	(★★)	★★★	(★★)
Functionality				
Sensitivity	★★★	★★★	★★★	★★★
Kinetics and affinity characterization	★★★	★★★	★★	★
PureKinetics™	★★★	★★★	★★★	★★★
Concentration analysis	★★	★★	★★	★★
Thermodynamic analysis	★★	★★	★★	★★
KineticTitration	★★★	–	–	–
Living cell measurements	★	★★	★★★	★★
Electrochemistry measurements	(★)	(★★)	(★★★)	(★★★)
Fluorescense measurements	–	(★)	(★★)	(★★)
Sensor slide range	★★★ planar and branched carboxymethyl dextran (CMD), HisTag, Au, SiO_2, PS, PDMS, etc.			
MP-SPR Software				
TraceDrawer™: Affinity and kinetics	★★★	★★★	(★★★)	(★★★)
LayerSolver™: Thickness and complex RI[a]	(★★★)	(★★★)	★★★	(★★★)
Control and Data Viewer	★★★	★★★	★★★	★★★

★★★ Optimal, ★★ Excellent, ★ Good,

★ in standard configuration, (★)optional feature

a) MP-SPR Navi LayerSolver™ is the most advantageous when combined with additional wavelength (-L) feature

All of our instruments are designed and manufactured in Finland.
To honor the Finnish roots of our products, we named our instruments after Finnish wild animals: OTSO (a bear), VASA (reindeer), NAALI (an artcis fox) and ILVES (a lynx).

More detailed specifications are available in product sheets.
Specifications are subject to change without prior notice.
Information in this catalogue is believed to be reliable. However, no responsibility is assumed for possible inaccuracies or omissions.

Our mission

**We develop Surface Plasmon Resonance (SPR) technology beyond today's capabilities.
We stay ahead of the latest developments to bring the best to the market.
We manufacture MP-SPR instruments with superior features and performance.**

Team of BioNavis

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Services

Besides instrumentation, BioNavis provides also measurement and testing services on contract basis. Our team of experts encompasses know-how on biomolecular interactions and on drug screening all the way to coating characterization. We measure different biochemical interactions (e.g. protein-protein, protein-antibody, drug-target, nanoparticle-target) as well as molecule or nanoparticle interactions with hydrogels or polymers, metals or release of such analysts from solid layers.

About MP-SPR Navi™

MP-SPR instruments have been developed in collaboration with Dr. Janusz Sadowski who has been the main driver in the research of SPR technique at VTT Technical Research Center of Finland for over 20 years, and Dr. Ulf Jönsson, the founder and former CEO of Biacore, the company that pioneered the use of SPR spectroscopy for protein interaction analysis.

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