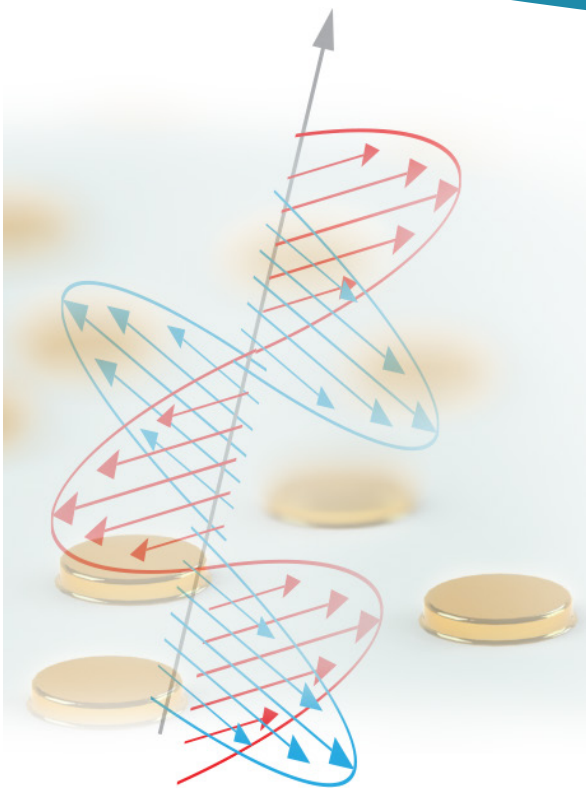
Insplorion

NanoPlasmonic Sensing



- **Real-time information** *showing changes in refractive index at the surface.*
- **Versatile** *with applications ranging from solid state material science to surface chemistry to biological interactions.*
- **Robust Technique** *that allows measurements at high temperatures and under harsh conditions.*
- *Short sensing depth imparts high* **Surface Sensitivity** *which reduces background signals.*
- **Optical** *measurement principle confers inherent stability and provides remote sensing possibilities.*

Insplorion's Nanoplasmonic Sensing Technology

Nanoplasmonic sensing (NPS) is an optical technology that exploits gold nanoparticles as local sensing elements. The nanofabricated plasmonic gold discs of the Insplorion sensors are embedded in a custom made dielectric material offering optimal protection and tailored surface chemistry of the sensor. In this arrangement, the gold nanodiscs act as optical antennas, which respond to processes at the sensor/sample interface.

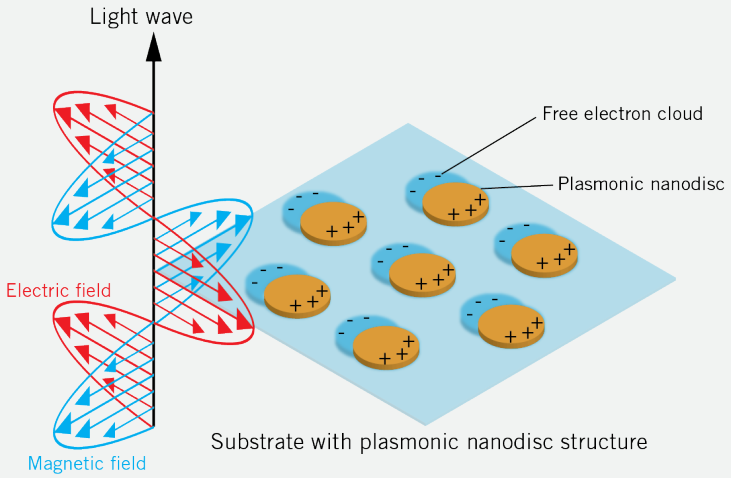
The technology constitutes a very versatile sensing platform that enables detection and monitoring of a large variety of material and interface processes under in situ conditions.

Insplorion
Sahlgrenska Science Park
Medicinaregatan 8A
413 90 Göteborg
Sweden
www.insplorion.com

Localized Surface Plasmon Resonance (LSPR)

A localized surface plasmon (LSP) is a coherent, collective spatial oscillation of the free electrons in a metallic nanoparticle. LSPs can be excited by the electromagnetic field of visible and near visible light. When white light passes through a plasmonic sensor, the nanoparticles absorb and scatter some of the light, leading to the emergence of a peak in the extinction spectrum.

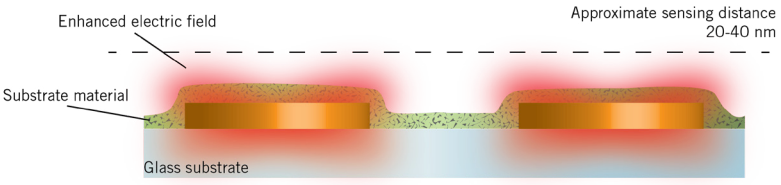
The resonance peak position is determined by the size, shape and material of the nanoparticle, and more importantly, it also depends on the refractive index of the medium in close proximity to the nanoparticle. Thus, by monitoring changes in the resonance peak, it is possible to detect and monitor processes influencing the dielectric environment of the nanoparticles on the sensor surface. This is the detection principle used in Insplorion's sensors.



Nanoplasmonic sensing is an optical technology for detecting and monitoring material and interface processes under in situ conditions.

Sensor Architecture

Insplorion's proprietary sensors are precisely manufactured in a state of the art cleanroom environment. The sensors consist of an amorphous gold nanodisc array coated with a dielectric material. Virtually any material that can be deposited (e.g. by CVD, PVD, ALD, spin-coating) as a thin film can be used as the coating material. Standards include SiO_2, Al_2O_3, and TiO_2. It is also possible to use the bare gold nanodiscs as a substrate.



Insplorion's sensors can be used to monitor substrate-sample and sample-sample interactions and/or chemical and physical processes in the substrate and sample materials.

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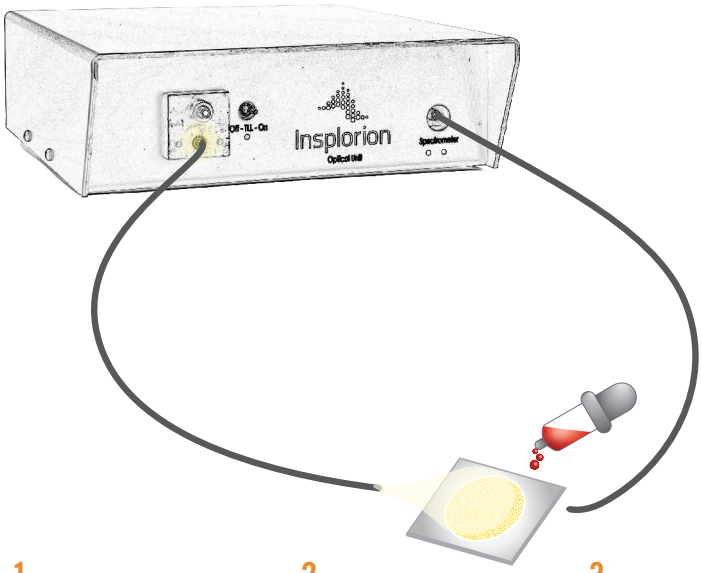
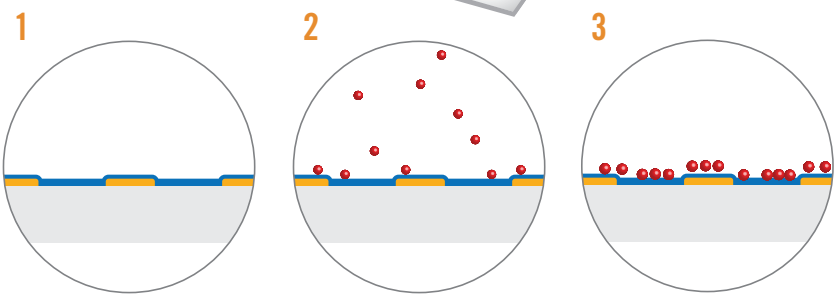
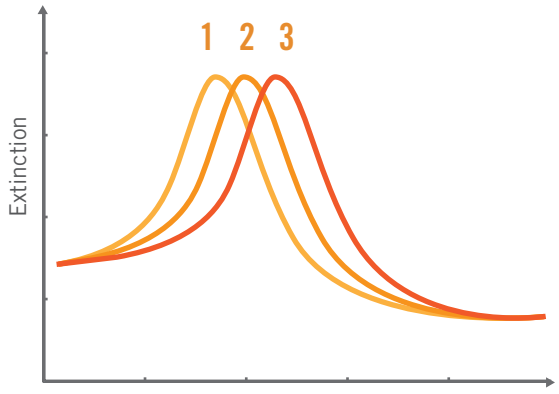
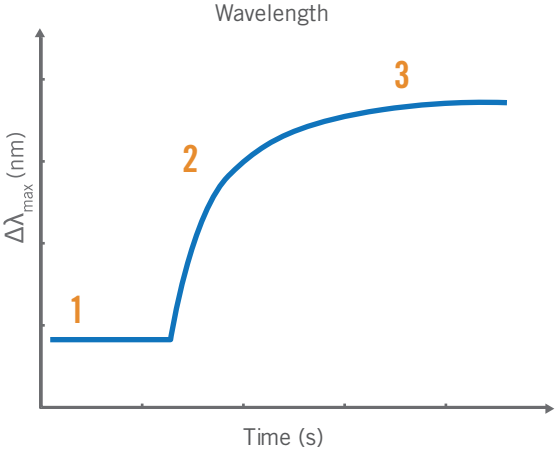
Measurement Principle

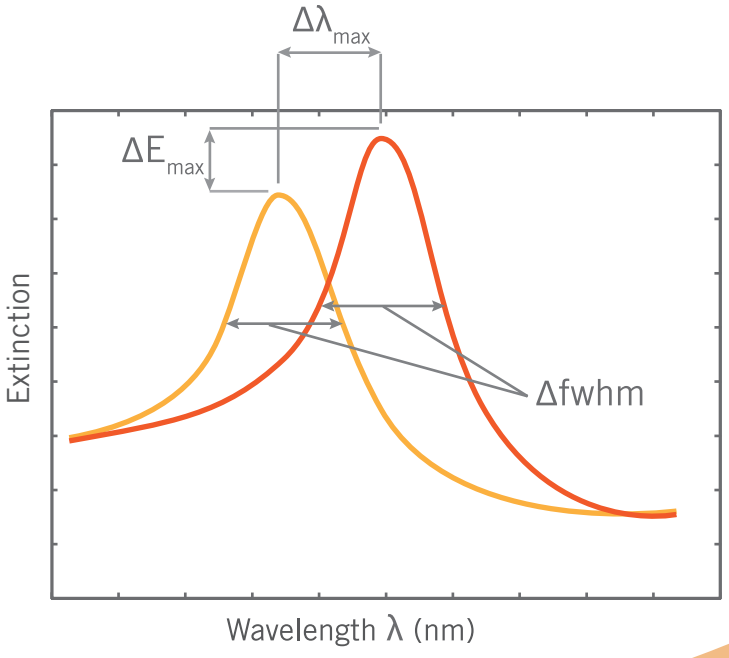
In the Insplorion measurement cell, white light is transmitted (XNano) or reflected (Acoulyte) through or by the sensor substrate, and the intensity is then measured as a function of wavelength by the Insplorer® software and the Insplorion Optics Unit. The optical response of an LSPR measurement is characterized by a distinct extinction peak at the plasmon resonance wavelength. During an experiment the spectral position of the peak is monitored as a function of time. Typically, wavelength shifts as small as 10^{-2} nm can be resolved with a temporal resolution of more than 1 Hz (down to 0.1 s).











Multiparameter Analysis

Changes in plasmon extinction peak-position ($\Delta\lambda_{max}$), height (ΔE_{max}), and width (Δfwhm) can be detected and evaluated in real-time.

The shift in peak position provides quantitative information on e.g. surface concentration, density, and mass.

Changes in the shape of the peak are related to changes in absorption, conductivity, and other material properties.

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Customer Testimonials

"We are very satisfied to gain full access to Insplorion's NPS technology in our own laboratory. We are convinced that it will be an important tool in our studies of how ionic liquids affect biomimetic membranes and cell membranes, which is related to their toxicity. Ionic liquids are expected to have a great potential within the forest industry thanks to their excellent solvating capacity for cellulose and biomass".

Professor Susanne Wiedmer
Department of Chemistry, University of Helsinki,
Instrument: Insplorion XNano

"The integration of NPS sensors with acoustic sensor techniques for simultaneous measurements on the same sensing surface enables unparalleled capabilities for probing the hydration and non-hydration mass properties of biological and biomaterial systems",

Professor Nam-Joon Cho,
School of Materials Science and Engineering; School of Chemical and Biomedical Engineering,
Nanyang Technological University, Singapore
Instruments: Insplorion XNano & Acoulyte

"We are excited to have the Acoulyte in our lab. Combining nanoplasmonic sensing with QCM-D allows us to simultaneously measure the dry (optical) and wet (acoustic) mass of protein and polymer adlayers on the same sensor and to acquire information on water content and adsorbate conformation. The Acoulyte complements our Q-Sense instrument and fits well with my research on environmental chemistry, for example helping us understand the behavior of prions in the environment and the interaction of polymers with model cell surfaces,"

Professor Joel A. Pedersen,
Department of Soil Science, University of Wisconsin-Madison,
Instrument: Insplorion Acoulyte

"The Insplorion X1, used in tandem with on-line mass spectrometry, is my main research instrument. For investigating the dynamics of catalysts, in action, it is a very useful instrument."

Dr. Hans Fredriksson,
Department of Chemical Engineering and Chemistry, Technische Universiteit Eindhoven,
Instrument: Insplorion X1

About Insplorion AB

Insplorion is a Swedish company built around its disruptive proprietary Nanoplasmonic Sensing platform. It was founded in 2010 on the basis of research at Chalmers University of Technology; and has been on the Swedish stock market since 2015. There are currently three main branches of operation; NPS-based research equipment (*Insplorion X1, Insplorion XNano, and the Insplorion Acoulyte*), battery sensors (*Insplorion InBat*), and air quality sensors (*Insplorion InAir*). When developing application specific devices, Insplorion often commercializes its sensor platform in collaboration with partners.

If you're interested in learning more about Insplorion's products, technology platform, or its applications, contact us directly.

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