Acoulyte
Optical spectroscopy with QCM-D

The Insplorion Acoulyte fits directly onto Q-Sense Explorer (E1) and Analyzer (E4) instruments when equipped with the Q-Sense window module. Insplorion Acoulyte sensors are Q-Sensors with an NPS structure.

- Understand complex surface and thin film processes.
- Obtain real-time changes in dry mass (refractive index), wet (acoustic) mass, and viscoelasticity for the same sample on the same surface and at the same time.
- Measure simultaneously under identical experimental conditions using Insplorion's Nanoplasmonic Spectroscopy (NPS) and Q-Sense's Quartz Crystal Microbalance with Dissipation monitoring (QCM-D).

NPS and QCM-D complementarity

What is detected?	
NPS	QCM-D
Change in RI close to the surface (<30 nm)	Change in mass through-out whole film

"The Insplorion Acoulyte is based on an exciting technology. It complements our Q-Sense offering and further expands the range of powerful surface analysis options available to our customers."

Johan Westman,Vice President, Analytical Instruments, Biolin Scientific

"With the Insplorion Acoulyte we now have a powerful tool to obtain complementary information at the same time about the diffusivity and the quantitative amount of molecules loaded in our membrane host structures based on metal-organic frameworks."

Prof. Dr. Christof Wöll, Karlsruher Institut für Technologie, Germany

"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, including dynamic interactions between various classes of biomacromolecules. Such capabilities open the door to a wide range of sensor applications across medicine and biotechnology."

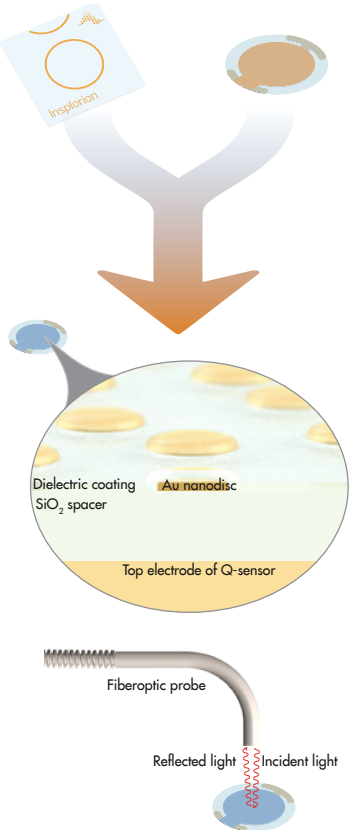
Prof. Nam-Joon Cho, Nanyang Technological University, Singapore

Insplorion's NPS technology

In Nanoplasmonic Spectroscopy (NPS), the localized surface plasmon resonance (LSPR) of a nanostructured sensor is used to probe minute changes in refractive index (related to optical/dry mass) close to (< 30 nm from) the sensor surface. This enables extremely sensitive detection of processes occurring at the sensor/sample interface.

Q-Sense QCM-D technology

Quartz crystal microbalance with dissipation monitoring (QCM-D) utilizes an oscillating quartz disc to measure the mass and viscoelasticity of thin films on the disc surface. The resonance frequency of the oscillation decreases when a thin film is attached to the sensor. By measuring the dissipation, it is possible to determine if the adsorbed film is rigid or viscoelastic (soft).



Sensor architecture

Each Acoulyte sensor consists of a Q-Sensor where the top electrode is coated with a SiO_2 layer on top of which the NPS sensing structure is placed. The sensors can be coated with a thin dielectric material. Standard coatings include SiO_2, Si_3N_4, Al_2O_3 and TiO_2. Combined measurement setup The Insplorion Acoulyte sensor is mounted in a standard Q-Sense Window Module and the Insplorion Acoulyte optical mount is placed on top of the module.

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Insplorion

Acoulyte
Optical spectroscopy with QCM-D

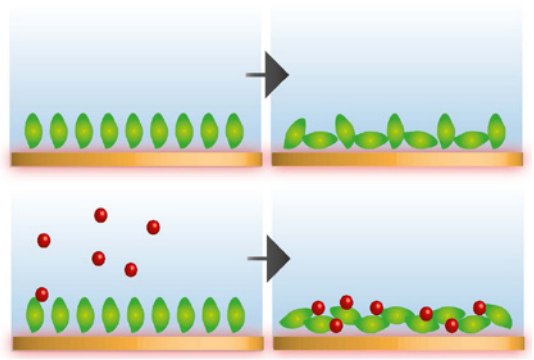
Simultaneous real time measurements with Nanoplasmonic Spectroscopy (NPS) and Quartz Crystal Microbalance with Dissipation monitoring (QCM-D).

Changes in mass, viscoelasticity and refractive index (RI) in real-time. Complementary information to understand complex processes fast and with confidence.

Molecular organization/conformation

What is detected?	
NPS	QCM-D
Change in RI close to the surface due to changes in molecular mass and/or conformation	Change in mass due to molecular adsorption/ desorption or change in solvent content Change in rigidity due to conformational

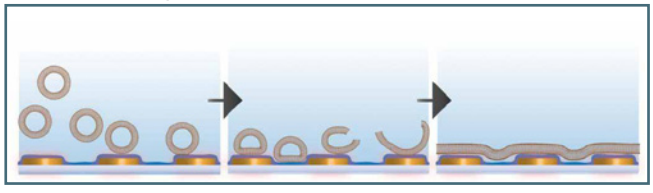
Combined NPS and QCM-D measurements will help interprete the signals from molecular adsorption, conformational changes and solvent loss.



Lipid bilayers

What is detected?	
NPS	QCM-D
Increase in RI when vesicles adsorb	Increase in mass when vesicles adsorb
Increase in RI when vesicles rupture	Decrease in mass when vesicles rupture

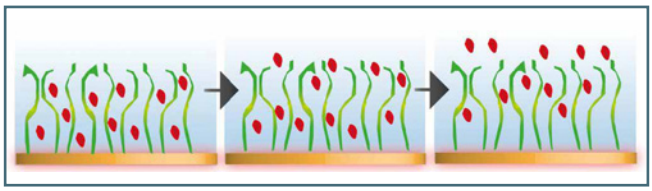
The Acoulyte enables more detailed interpretation of the formation process of thin surface films.



Molecular desorption (adsorption)

What is detected?	
NPS	QCM-D
Change in RI close to the surface (<30 nm)	Change in mass through-out whole film

Time- and depth resolved measurement of molecular desorption (adsorption) from thick films (<~1 mm). Using the Acoulyte it is also possible to discriminate swelling from adsorption/desorption events

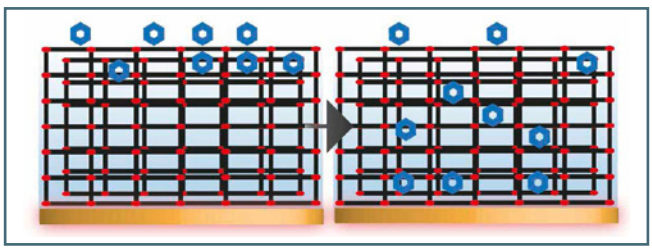


Polymers, hydrogels

Gas adsorption/desorption

What is detected?	
NPS	QCM-D
Change in RI at the sensor/ sample interface	Change in RI at the sensor/sample interface

By combining QCM-D and NPS it is possible to achieve depth-profiling and to study diffusion times and mechanisms in surface supported films.



Metal-organic frameworks, polymers, hydrogels, porous films

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