



INPHAZE Impedance Spectrometer

Thickness and structure of

- *Surface monolayers*
- *Bionic interfaces*
- *Semiconductors*
- *Lipid bilayers*
- *Membranes*
- *Polymer films*





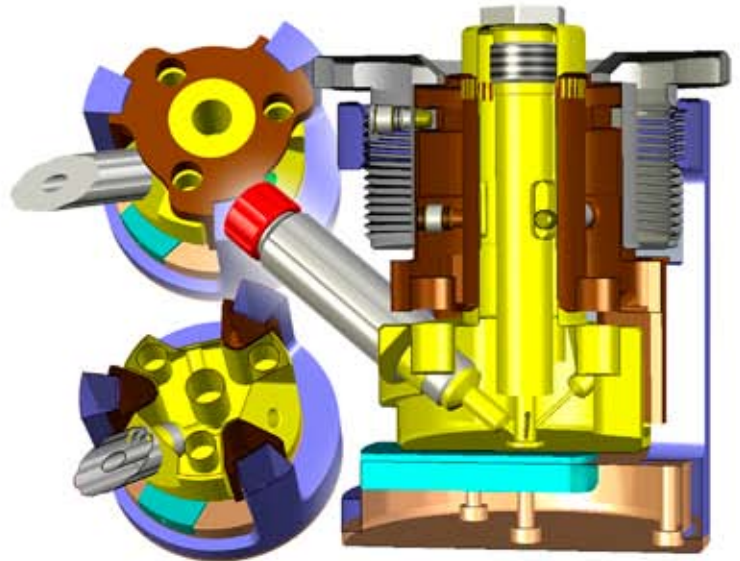
Inphaze Impedance Spectrometer

The innovative features of the **INPHAZE** spectrometer enable it to achieve very high structural resolution, especially at low frequencies. The whole frequency spectrum from, milli- to megaHertz, is covered at very high precision:

- Phase precision of 0.001°
- Impedance magnitude error of only 0.002%

Such precision measurements of impedance and phase, as a function of frequency, allow for structural resolution such as that normally provided by X-ray diffraction or neutron reflectometry.

Detailed information about the fine structure of layered materials and thin films down to the nanometre scale can be obtained. The INPHAZE system can also provide valuable information about ion transport processes across natural and artificial membranes.

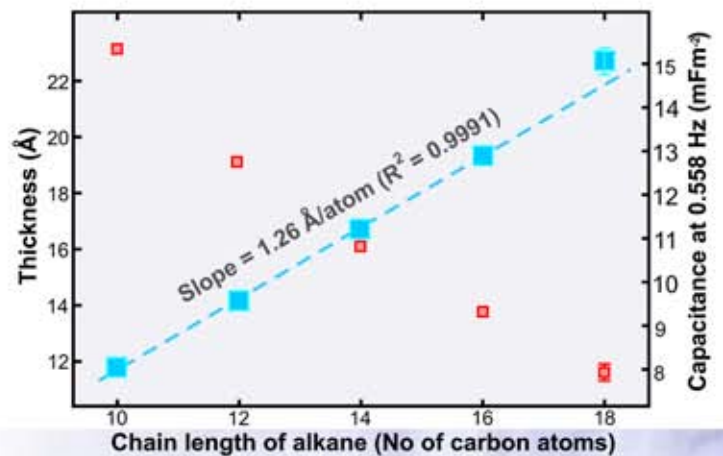


The **INPHAZE** system comprises a:

- High-precision Impedance Spectrometer
- Measuring Chamber (two-, three- or four-terminal) in Faraday cage

and comes with two advanced software packages that:

- control the **INPHAZE** Spectrometer; and
- interprets the impedance and phase data, including model optimisation routines for structural parameters, and a range of graphical output options.





The **INPHAZE** Impedance Spectrometer is fitted with a specialised measuring chamber. These have four-, three- or two-terminal electrode configurations, depending on your research requirements:

- A four electrode chamber has been designed for membrane studies, ionic materials and for electrolyte based systems.
- Three-terminal measurements are ideal for studies of films on semiconductor wafers, or on solid electrode surfaces.
- Two-terminal measurements work well for many biological applications.

The **INPHAZE** Spectrometer can also be used with commonly available electrochemical measuring cells, such as those used with potentiostats.

INPHAZE Specifications

Frequency range: 0.006 Hz to 1 MHz

Covers the range needed for nanotechnology and biotechnology applications.

Measurement range: 0.1 to 10^{10} Ohms.

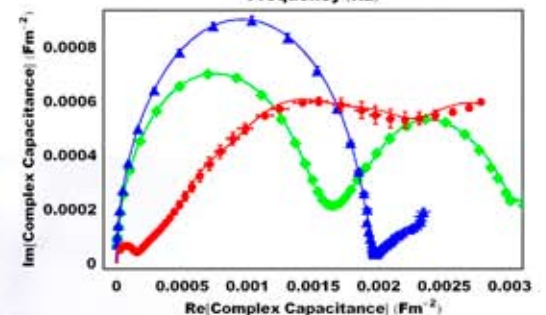
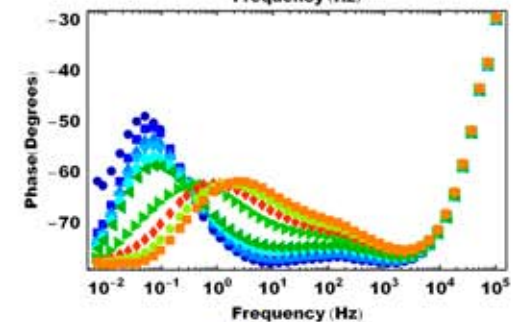
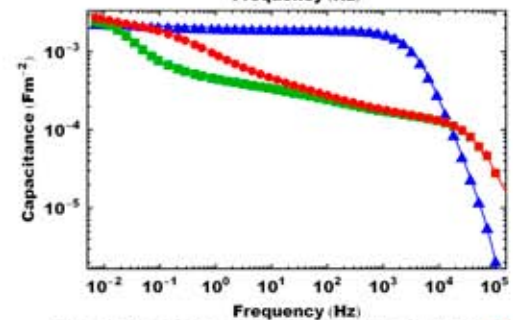
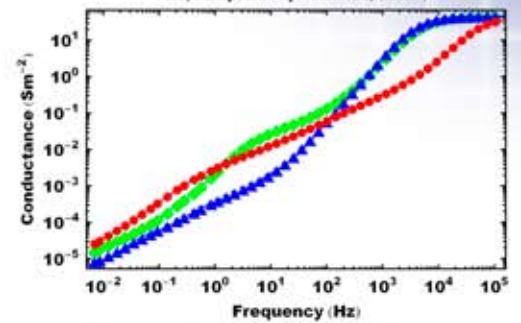
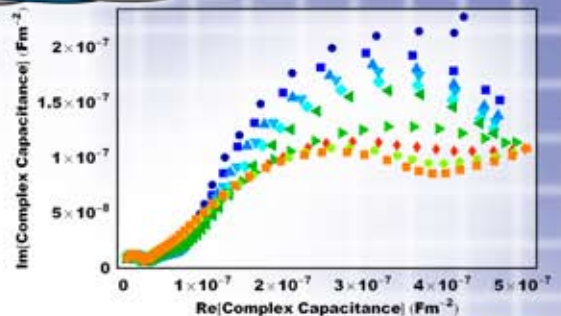
The **INPHAZE** instrument is the only commercial spectrometer which can measure such an impedances range over the entire frequency spectrum.

Phase error: 0.001°

The lower error, the higher the precision. The **INPHAZE** spectrometer delivers higher phase resolution than any other commercial instrument, especially at low frequencies.

Magnitude error: 0.002%

This is the ratio of the amplitudes of the voltage and current signals. The magnitude yields information on the electrical properties of the sample and, in conjunction with precise phase measurements, allows down to atomic scale resolution of the structure of layered materials.





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Impedance Spectroscopy

Electrical impedance spectroscopy (EIS) applies a small, non-destructive, AC waveform to a sample and measures the subsequent attenuation and phase shift of the signal. The experiment is repeated over a range of frequencies and the results are modelled as a combination of resistors and capacitors which, in turn, are interpreted as the thickness and position of layers forming the surface, or interface, of the sample.

INPHAZE Technology

Unlike most other impedance analyzers, the INPHAZE spectrometer provides highly accurate phase and magnitude measurements across its whole frequency spectrum (by a recently patented method). This provides new opportunities for resolving ever thinner layers within a surface structure.



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Think inside the box

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