



SENSOLYTICS

ELECTROCHEMISTRY AT THE TIP

The Sensolytics SECM

Modular System

Customized Solutions for Detection of Local Electrochemistry

Easy Operated Software

Option High-Res

Structure Size < 10 μm

Option Shearforce

Structure Size < 1 μm

SPECM

Scanning Photoelectrochemical Microscopy

SDC

Scanning Droplet Cells Technique

Option AC

Impedance Spectroscopy (FRA Module)

Option Video

Visual Prepositioning

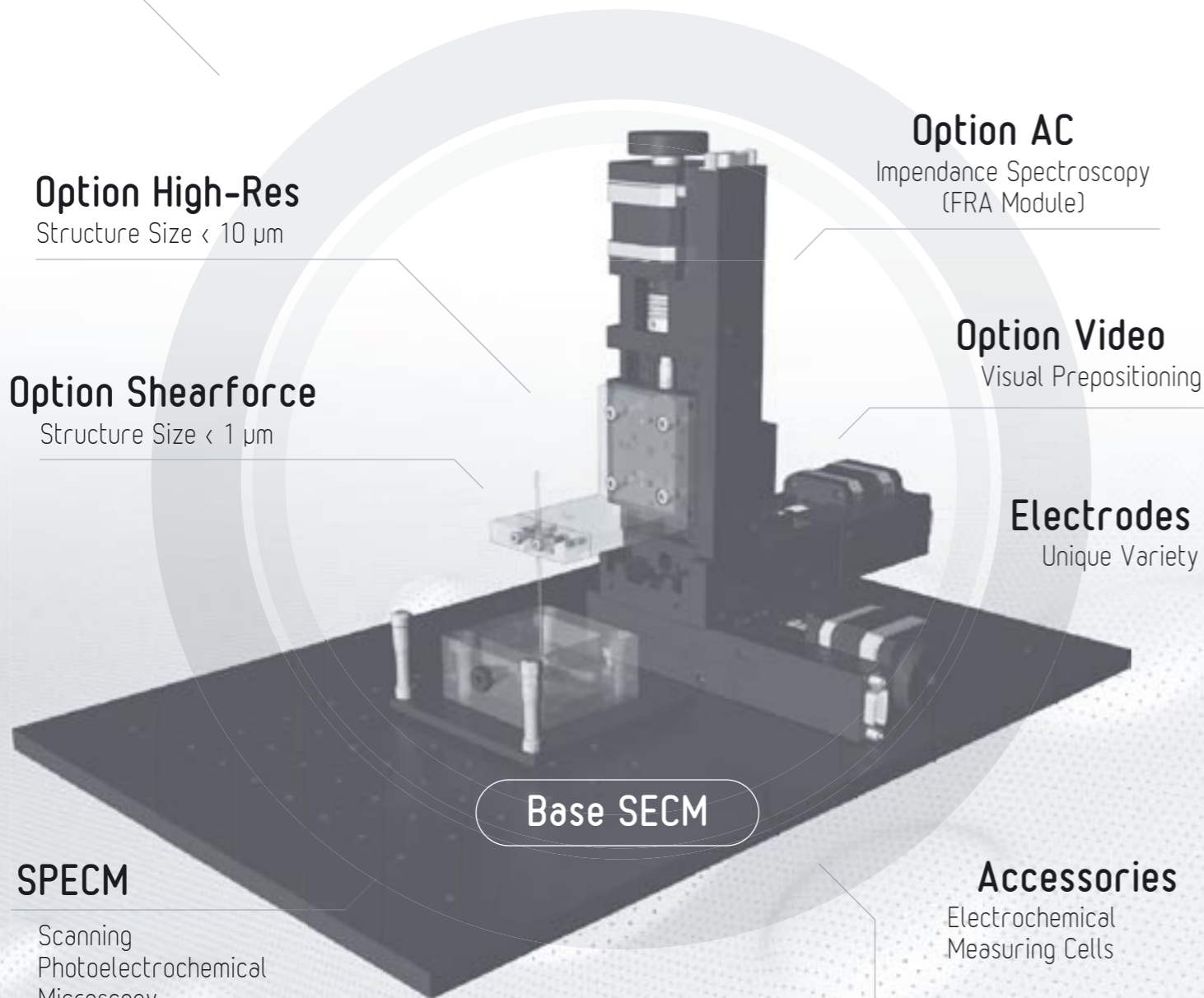
Electrodes

Unique Variety

Accessories

Electrochemical Measuring Cells

Base SECM



Sensolytics Base SECM



The starting point for all SECM experiments. Compact size and open design for increased flexibility.

- xyz-positioning system: 25 mm/axis (stepper motors, calc. min. step width 20 nm)
- Electrode beginners kit and a test structure included
- Versatile PMMA measuring cell
- Sensolytics SECM software
- Combination with Autolab potentiostats

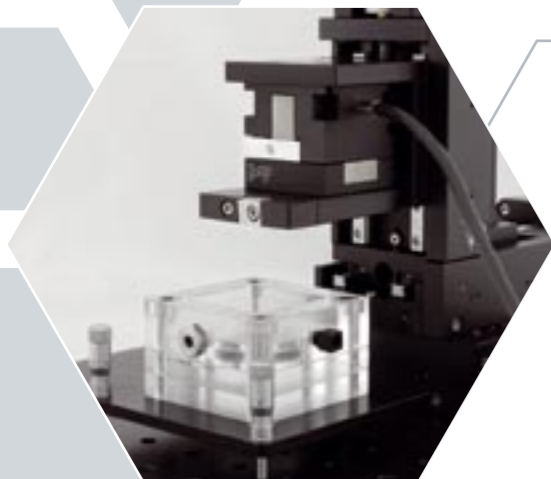


Magnetic system for a secure and convenient attachment of the tip

- Minimizes risk of tip break
- Additional screw for immovable fixture
- Adapted clamps for different glass diameters available
- Specifically adapted for SECM experiments inside a glove box

Sensolytics SECM systems grow with your specific requirements. Sensolytics customers are free to upgrade their system with additional features at any time.



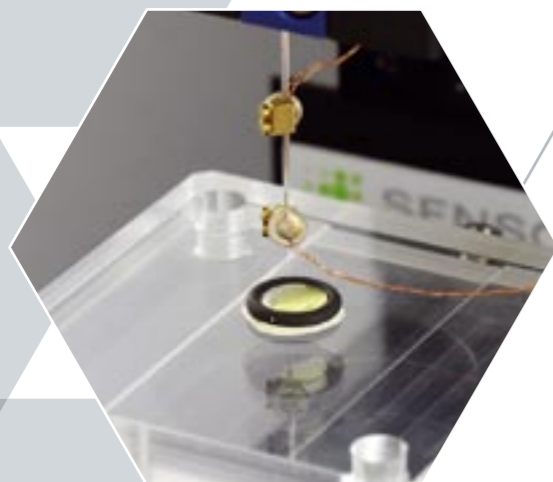


OPTION HIGH-RES

Additional piezoelectric positioning system mounted in the tip holder for high resolution movements

- Travel range (x, y, z): 100 μm /axis
- Resolution: 1 nm (closed-loop, strain gauge sensor)

This option additionally provides a software-based tilt correction procedure for elimination of tilt effects between tip and sample surface.



OPTION SHEARFORCE

Constant-distance mode imaging for electrodes in the submicrometer range and rough samples

- Deconvolution of topography and activity effects
- Set of piezoelectric actuators and starter set of tips included
- On site training included

Utilizes Option High-Res and vibratory nanoelectrodes.



OPTION VIDEO

Visual control of tip prepositioning

- Long working distance optics with manual magnification
- Monochrome USB CCD camera for high definition images
- Live-view and capture is integrated in the SECM software for convenient tip observation

The position is freely adjustable for optimal angle of view at any time.



OPTION AC

Impedance spectroscopy performed at the tip in close distance to the sample surface (AC-SECM).

Investigation of sample interface even without added redox mediator and in highly diluted solutions. Particularly interesting for corrosion applications.

Full impedance spectra at each point of the scanned grid or scan at one fixed frequency with Autolab FRA module (Frequency range: 10 μHz – 1 MHz).



OPTION ANALOG IN

Allows reading analog signals from up to eight external data sources, e.g. for combining SECM with further analysis techniques.

All channels are equipped with BNC connectors and have a max. input limit of 10 V.



FARADAY CAGE

Shielding for Sensolytics SECM systems with compact size (W 50 x H 45 x D 70 cm) specifically adapted to SECM base plate dimensions.

Convenient door for experiment handling, sealed cable inlets and decoupled from positioning system to avoid vibration transmission.



LINEAR STAGE UPGRADES

Extended travel range for positioning system up to 145 mm.

Looking for further customized solutions? Get in contact with us via info@sensolytics.de. We will be happy to explore with you your individual instrument configuration.

Scanning Photoelectrochemical Microscopy SPECM

Local illumination and simultaneous electrochemical detection via optical fiber and Au ring electrode.



- Core diameter: 200 μm
- Cladding diameter: 220 μm
- Coating diameter: 255 μm
- Wavelength range: 190–1250 nm (UV-Vis)

The SPECM tip fits in our standard SECM electrode holder. Its rear end is equipped with a SMA connector. Complete system with light source or use of own components possible.

SECM on Inverse Optical Microscope

Upgrade of any Sensolytics SECM system with inverse optical microscope

- Suitable particularly for biological applications
- Adapters for standard petri dishes and standard Sensolytics SECM measuring cell



Scanning Droplet Cell SDC

Localization of electrochemical investigation by mobile miniaturized electrochemical cell

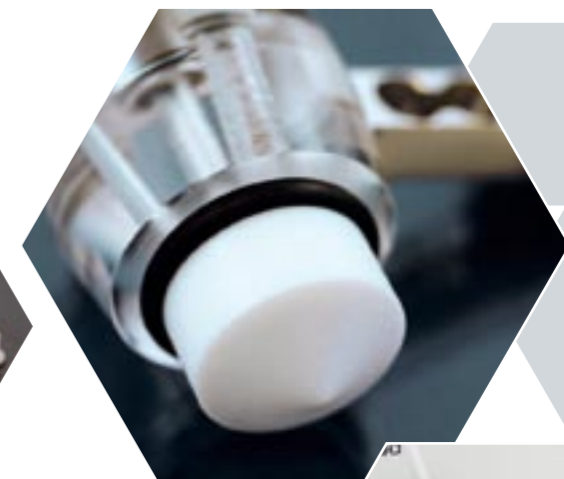
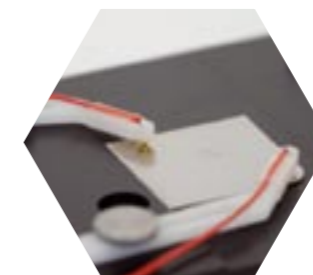
- Only small surface area is in contact with electrolyte
- Precise head positioning via force sensor control
- Large samples and demanding sample contours accessible with linear stages up to 145 mm travel distance
- SDC tip openings in 1.0 mm, 0.5 mm or 0.2 mm diameter, customization possible
- Micro-metering pump with 1 μl smallest volume for reproducible droplet formation
- Fully automatic procedures for exchange of electrolyte
- Sequence of electrochemical experiments at each grid point
- AC-SDC
- SDC head directly usable in SECM tip holder



SDC for Photoelectrochemistry

Integrated light fiber for local illumination

Complete system with light source and shutter or use of own components



Electrodes

The resolution of SECM experiments depends on the diameter of the utilized microelectrode (the SECM tip). Higher spatial resolution requires the use of tips with smaller active diameters.

Sensolytics provides the broadest selection of electrodes for SECM in the market.

Platinum	100 μm , 50 μm , 25 μm , 10 μm , 5 μm and 1 μm
Gold	100 μm , 50 μm , 25 μm , 10 μm
Platinum, nano	200–500 nm and 500–1000 nm
Carbon fiber	7–9 μm (polymer insulated)
Platinum	Counter electrodes (coil and net type)
Nickel	10 μm , 25 μm
Micro-twin-electrode	Platinum 10 μm /10 μm Platinum 25 μm /25 μm

Further materials and customized designs on request.
All electrodes optionally available with gold contact pin.

ELECTRODE POLISHING SET

Easy to use manual cleaning set for microelectrodes for reproducible electrode pretreatment

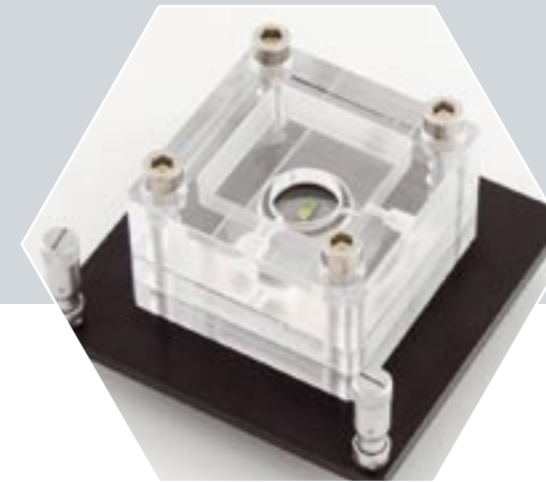
Refill sets of different sizes

ELECTRODE HOLDER FOR MEASURING CELLS WITH STANDARD JOINT

Holder for fixation of microelectrodes in electro-chemical measuring cells with standard joint NS14

Measuring Cells

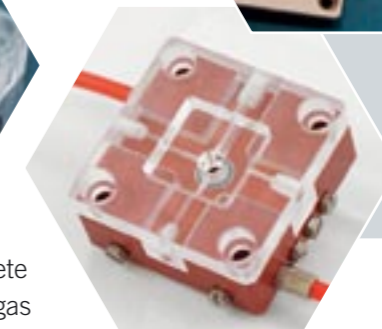
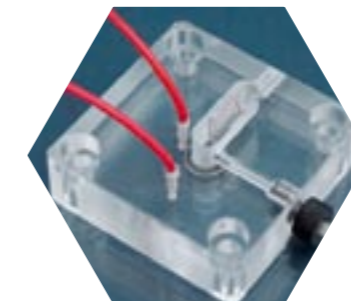
Wide variety of Sensolytics SECM measuring cells available for unique flexibility in sample geometry



Versatile measuring cell included in Base SECM with adjustable base plate for manual tilt compensation and distance pieces for height adaptation

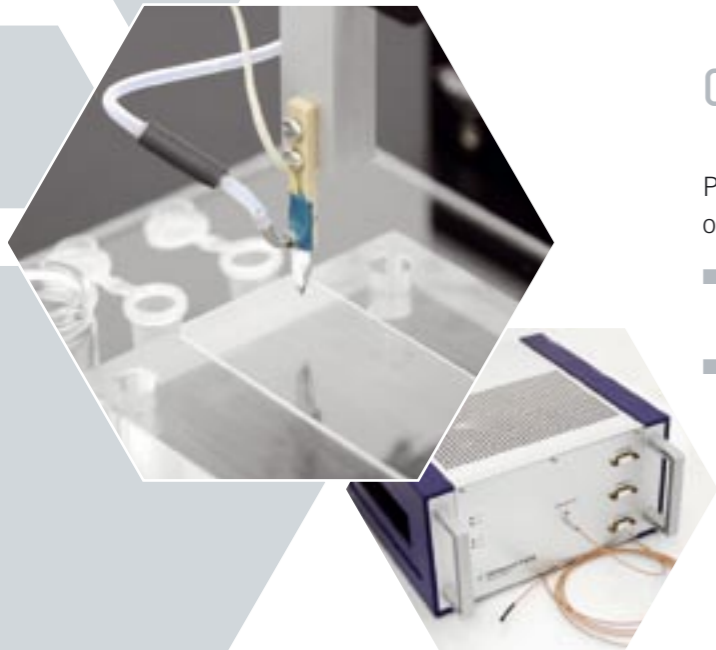
Reference and counter electrode securely fixed for reproducible experiment setup

PMMA for easy positioning of tip due to transparent design, PEEK cells for enhanced chemical stability



Specialized cells for stick electrodes, complete wafer, with temperature control, solution or gas exchange.

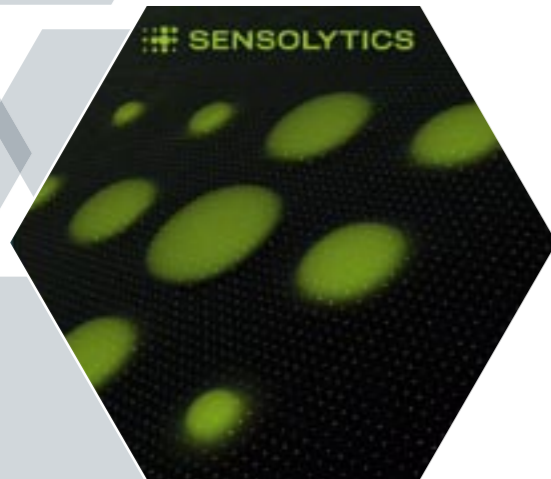
Your sample geometry is not matched?
Please contact us and ask for your customized measuring cell.



Option PicoPlot

Piezoelectric dispensing device for sample preparation, e.g. material libraries

- Dispensing head for droplet sizes of 100–200 μl or 600–1100 μl
- Dispensable media: Dextrane solutions, Glycerol (< 50 % in H₂O), Polymers, Proteins (< 5 mg/ml in PBS) and many others



Sensolytics Software

The intuitive and easy to use SECM Software includes all necessary features for a reliable and flexible experimental design

- On-line preview of experiment results, 3D visualization of array scan data including graphic export, topography image for constant-distance mode, automatic approach curve, tilt compensation
- Complete EC experiments performed at each grid point
- Impedance spectra for AC-SECM (Nyquist and Bode plots, 3D images for Array Scans for real and imaginary part, modulus and phase at each frequency)
- Different modes of tip movement during array scans
- Current-independent constant-distance mode for high-resolution experiments (Option Shearforce)

Mira

Powerful analysis software package not only for SECM data files. Various data representation options, analysis and curve fitting tools. Developed by Prof. Dr. Gunther Wittstock, Carl von Ossietzky Universität Oldenburg.

Sensolytics Base SECM

Three axes stepper-motor-driven stage on base plate with size of 30 x 45 cm
Travel range: 25 x 25 x 25 mm*, min. step width: 20 nm (calc.), repeatability (bidirectional): < 15 μm

[*each axis can be extended to 50, 70, 95 or 145 mm travel range upon customer request]

PMMA measuring cell with adjustable baseplate size 65 x 65 mm, opening for sample about 17 mm diameter, volume up to 20 ml

Beginners kit consisting of electrode set (10 μm and 25 μm Pt microelectrode, counter and reference electrode), training structure, polishing starter kit

Sensolytics SECM systems are designed for the operation with Metrohm Autolab potentiostats. The Autolab potentiostat is directly controlled by the SECM software and synchronized with all other components.

Detection Modes (among others) Feedback Mode, Generator-Collector Mode, Direct Mode, multidimensional SECM, OCP maps, automatic approach function (also at each grid point during array scans)

Option High-Res

Three axes piezo stage

Travel range: 100 x 100 x 100 μm

Min. step width: 1 nm (closed-loop, SGS sensor)

Repeatability (bidirectional): < 10 nm

Automatic tilt-compensation function

Option Shearforce

Current-independent constant-distance mode for high resolution experiments

Option Video

Working distance approx. 10 cm

0.7X to 4.5X continuous zoom

Field of view: 1.4 cm at min. magnification, 2 mm at max. magnification

Option SDC

Mobile miniaturized electrochemical cell positioned with force sensor control (2 N max. force with 0.5 mN resolution)

PTFE tip opening: 1 mm, 0.5 mm and 0.2 mm

Micrometering pump with 1 μl smallest volume

Option PicoPlot

Piezoelectric dispensing device

Dispensing head for droplet sizes of 100–200 μl or 600–1100 μl



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