Raman Spectroelectrochemical Instrument

Ref. SPELECRAMAN

The equipment can also be used independently as a **Raman Spectrometer** or as a **Bipotentiostat/Galvanostat**.

General Specifications	
Power	5 V DC
PC interface	USB
Dimensions:	25 x 24 x 11 cm (L x W x H)
Weight	3490 g

Potentiostat/Galvanostat	
Operating modes	BiPotentiostat, Potentiostat, Galvanostat
DC-Potential range	±4 V
Current ranges (potentiostat)	±1 nA to ±10 mA (8 ranges)
Maximum measurable current	±40 mA
Potential ranges (galvanostat)	±100 mV, ±1 V (2 ranges)
Applied Potential Resolution	1 mV
Measured Current Resolution	0.025 % of current range (1 pA on lowest current range)
Applied Current Resolution	0.1 % of current output range
Measured Potential Resolution	0.012 % of potential range
Potential Accuracy	±0.2 %
Current Accuracy	≤0.5 % of current range at 100 nA to 10 mA

Lightsource Laser Class 3B	
Wavelength	785 ± 1 nm
Spectral line width	< 0.2 nm FWHM
Stability	± 0.1 nm (-20 to 55°C)
Optical power output	500 mW (375 mW typical)
Output power stability	± 1%
Warm-up time	10 s from cold start; 1.5 s from warm start
Fiber optic connector	FC

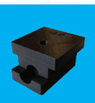
Spectrometer	
Detector	2D CCD Array, Back thinned TE Cooled
Pixels	1044 x 64
Wavelength range	785 – 1010 nm
Raman shift	0 – 2850 cm^{-1}
Resolution	< 4 cm^{-1} (0.3 nm)
Signal-to-noise ratio	1000 : 1 (at full signal)
Dynamic range	85000 : 1
Integration time	8 ms to 60 min
A/D resolution	18 bit
Fiber optic connector	SMA 905

Specifications are subject to change without previous notice

SERS effect to enhance Raman signals and detect low analyte concentrations in solution can be achieved with silver, copper, Ag@Cu and gold screen printed electrodes among others already available in our catalogue (ref. 010, CU10, SPECU10, 220AT).

SPELEC RAMAN can be used with standard RAMAN cuvettes, but also with the new innovative DropSens cells for RAMAN SPECTROELECTROCHEMISTRY experiments using screen-printed electrodes.

Related products



RAMAN CELL

RAMAN PROBE

CU10

220AT

010

SPCU10

Full Catalogue

Contact Form

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Raman Spectroelectrochemical Instrument

Ref. SPELECRAMAN

Combination of Raman and Bipotentiostat/Galvanostat in a **fully integrated synchronized Raman Spectroelectrochemical instrument**.

- **Compact & Light** Instrument
- **Cost-effective**
- Extremely **easy set-up**
- **Advanced data acquisition**
- **Easy data handling** integrated in software

SPELEC RAMAN is the world´s only equipment in the market for performing **RAMAN SPECTROELECTROCHEMISTRY** studies combining in **only one box** a **LASER** Class 3B (785 nm), a **Bipotentiostat/Galvanostat** (± 4 V potential range, ± 40 mA current range) and a **Spectrometer** (wavelength range 785 – 1010 nm and Raman shift 0 – 2850 cm^{-1}).

All the components are perfectly fitted and synchronized, offering for the first time a **fully integrated synchronized Raman spectroelectrochemical instrument**.

√ **RAMAN SPECTRA** advantages: compatible with aqueous samples, rapid identification, non-destructive.

√ **Real time Raman spectroelectrochemistry** with **SYNCHRONIZED RAMAN** and **ELECTROCHEMICAL** measurements:

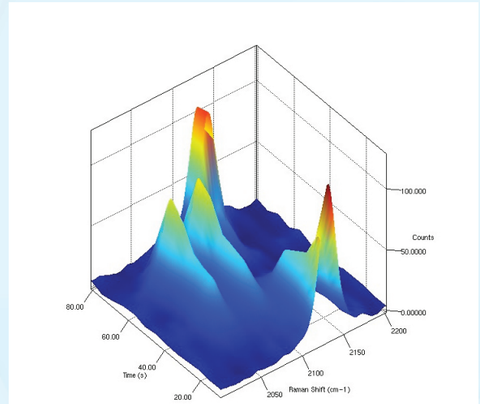
- ➤ Surface **characterization**: new materials development, **corrosion** analysis, battery testing,...
- ➤ **EC-SERS** for enhanced Raman Spectra increasing detection **sensitivity**.

√ Ideal for **qualitative & quantitative analysis**: high sensitivity and reproducibility.

√ **In-situ, real time and synchronized Raman and Electrochemical measurements**.

SPELEC RAMAN is controlled by the **DROPVIEW SPELEC Software**, which provides powerful functions such as:

- **Time resolved RAMAN**.
- **Power** laser control.
- **Real Time panel** that collects the generated spectra not only during the electrochemical measurement but continuously at any time.
- Spectroscopic measurements in **Counts, Counts minus Dark, Raman, Raman Shift** during the Electrochemical process.
- Plot of **Optical Signals vs. Potential/time Curves** at specified wavelength and Raman Shift.
- Plot overlay, peak integration, smoothing, subtraction, derivative curve, baseline fitting.
- **3D** plotting of curves, **spectrum film**.



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Raman Spectroelectrochemical Instrument

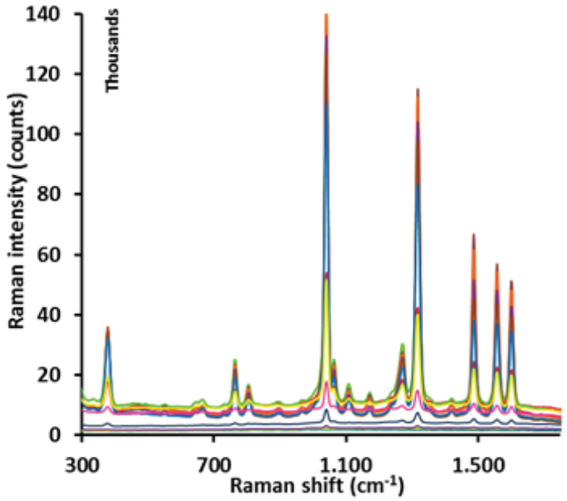
Ref. SPELECRAMAN

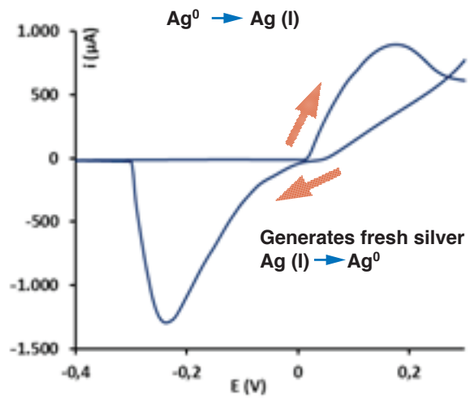
In-situ Surface Enhanced Raman Scattering (SERS)

This sensitive technique enhances Raman scattering when molecules are adsorbed on rough metal surfaces.
Really powerful for highly sensitive detection of low concentration analytes.

1µM Tris(bipyridine)ruthenium (II) chloride in 0.1M KCl over screen-printed silver electrode (ref. C013).

Time-resolved spectra





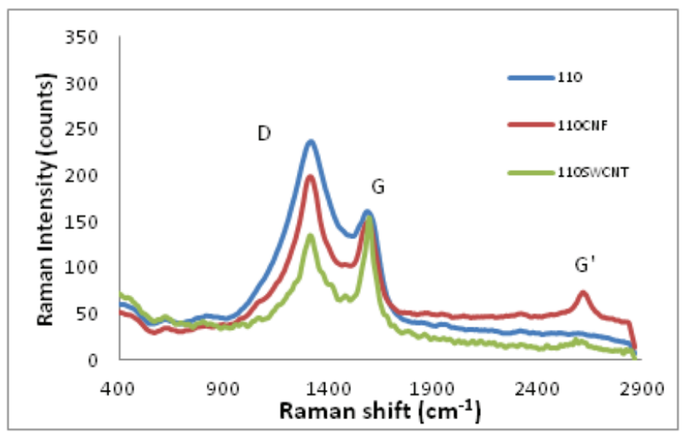
SERS effect is produced thanks to electrochemically reduced silver in presence of analyte in solution.

Experimental conditions: Cyclic Voltammogram E0= 0.3V, Evtx1= -0.4V, Evtx2= 0.3V, Step potential= 2 mV,Scan rate= 50 mV/s;
Raman's experiment parameters: Integration time 2 s, Laser power= 0.7 V.

Materials characterization by RAMAN

Raman spectroscopy allows knowing in effortless way information about the structure of materials.

For example, the G and D bands of the Raman spectra from carbon materials provide information about the fraction of sp^3 and sp^2 bonds that provide knowledge on the layered structure of these materials.

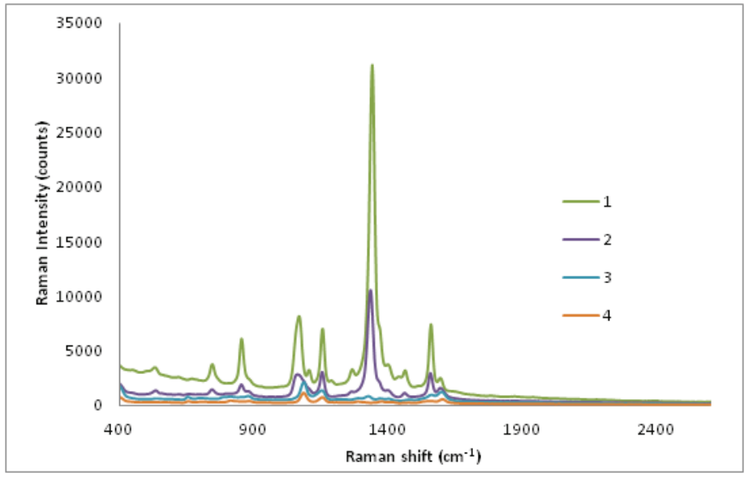


Raman spectra comparison between Screen-Printed carbon Electrodes (ref. 110),
Single-walled carbon nanotubes modified Screen-Printed carbon Electrode (ref. 110SWCNT)
and Carbon Nanofibers modified Screen-Printed carbon Electrode (ref. 110CNF),
Relationship between D and G bands' intensity provide us information about these materials structure.

Spectroelectrochemical RAMAN analysis

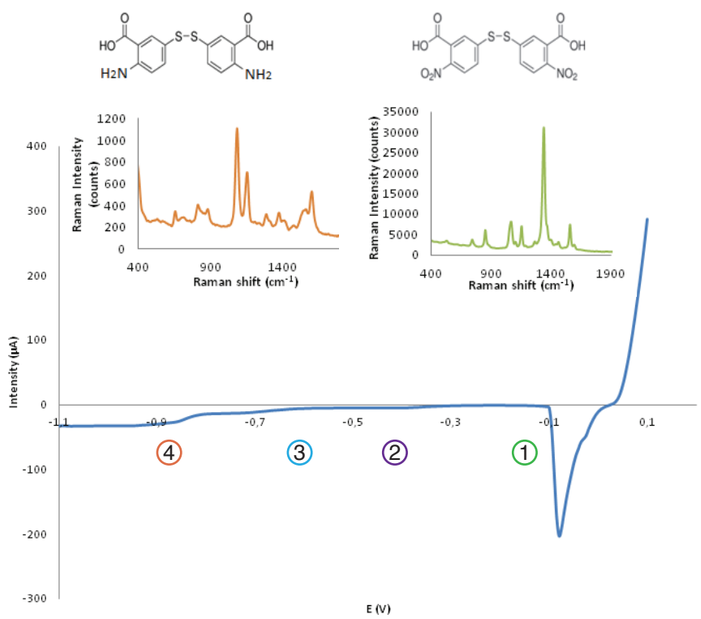
Combination of electrochemical methods with RAMAN analysis provides information about the reaction and products generated electrochemically *in-situ*, time resolved and synchronized. SPELEC RAMAN is a perfect tool for quantitative and qualitative analysis. Detect the behaviour of molecules in different oxidation states taking advantage of the SERS effect making spectroelectrochemistry a powerful technique for a wide range of different applications.

Electrochemical reduction of DNTB (Ellman's reagent) and simultaneous RAMAN analysis



Time resolved RAMAN spectra obtained while electrochemical reduction of
DNTB (5,5'-Dithiobis(2- nitrobenzoic acid))is carried out with Screen-Printed silver Electrodes.
Raman's spectra parameters: Integration time: 1s, Laser power= 0.6 V.

Spectra 1, 2, 3, 4 obtained during below EC measurement



Linear sweep voltammogram of DNTB reduction over Screen-Printed silver Electrodes (ref. C013).
Experimental conditions: Cyclic Voltammogram E_0= 0.1V, E_{end}= -1.1,
Step potential= 5 mV, Scan rate= 25 mV/s;

Full Catalogue

Contact Form