Raman Spectroelectrochemical Instrument

Ref. SPELECRAMAN, SPELECRAMAN638, SPELECRAMAN532

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

**SPELEC RAMAN** is the only instrument in the market for performing **RAMAN SPECTROELECTROCHEMISTRY studies** combining in only one box a **LASER** [wavelength: 785 ± 0.5 nm (SPELECRAMAN) / 638 ± 0.5 nm (SPELECRAMAN638) / 532 ± 0.5nm (SPELECRAMAN532)], a **Bipotentiostat/Galvanostat** (± 4 V potential range, ± 40 mA current range) and a **Spectrometer** [wavelength range 35-3000 cm⁻¹ (SPELECRAMAN) / 50-4370 (SPELECRAMAN638) / 75-4520 cm⁻¹ (SPELECRAMAN532)].

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:

- **Operando / Time-resolved Raman spectroelectrochemistry**.
- **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 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, film.
- Export to .csv all synchronized data.
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The equipment can also be used independently as a Raman spectrometer or as a Bipotentiostat/Galvanostat.

### General specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>5 V DC</td>
</tr>
<tr>
<td>PC interface</td>
<td>USB</td>
</tr>
<tr>
<td>LED indicators</td>
<td>Power</td>
</tr>
<tr>
<td>Dimensions</td>
<td>25 x 24 x 11 cm (L x W x H)</td>
</tr>
<tr>
<td>Weight</td>
<td>3600g</td>
</tr>
</tbody>
</table>

### 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
- **Applied Current Resolution**: 0.025 % of current range (1 pA on lowest current range)
- **Measured Current Resolution**: 0.1 % of current output range
- **Measured Potential Resolution**: 0.012 % of potential range
- **Current Accuracy**: ≤0.5 % of current range at 100 nA to 10 mA
- **Potential Accuracy**: ±0.2 %

### Lightsource - Laser Class 3B

- **Wavelength**: 785 ± 0.5 nm (SPELECRAMAN) / 638 ± 0.5 nm (SPELECRAMAN638) / 532 ± 0.5 nm (SPELECRAMAN532)
- **Spectral line width**: < 0.1 nm (typical < 0.08 nm)
- **Stability**: 15 to 45°C
- **Optical power output**: 500 mW (SPELECRAMAN) / 300 mW (SPELECRAMAN638) / 50 mW (SPELECRAMAN532)
- **Output power stability**: ±1%
- **Warm-up time**: 10 s from cold start, 1.5 s from warm start
- **Fiber optic connector**: FC/PC

### Spectrometer

- **Detector**: 2D CCD Array, Back thinned TE Cooled
- **Pixels**: 1044 x 64
- **Wavelength range**: 787–1027 nm (SPELECRAMAN) / 640–885 nm (SPELECRAMAN638) / 534–700 nm (SPELECRAMAN532)
- **Raman shift**: 35–3000 cm⁻¹ (SPELECRAMAN) / 50–4370 cm⁻¹ (SPELECRAMAN638) / 75–4520 cm⁻¹ (SPELECRAMAN532)
- **Resolution**: < 4 cm⁻¹ (SPELECRAMAN) / < 4.5 cm⁻¹ (SPELECRAMAN638 and SPELECRAMAN532)
- **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 and gold screen printed electrodes among others already available in our catalogue (ref. 010, C013, 220BT).

**SPELEC RAMAN** can be used with any kind of Raman cells, but also with the new innovative Metrohm DropSens cells for Raman spectroelectrochemistry experiments for conventional electrodes (RAMANCELL-C) or with screen-printed electrodes (RAMANCELL).