Metrohm Hyphenated EC-Raman

Another dimension for your battery research

PEOPLE
YOU
CAN
TRUST

Metrohm

Another dimension for your battery research

Find out more by **combining electrochemical techniques** and ***in situ* Raman spectroscopy** for **simultaneous structural** and **functional** information about your anode/cathode materials and their transformation.

By synchronizing your electrochemical measurements with *in situ* Raman spectra acquisition, you can track **age-induced structural changes** in your materials, **electrolyte decomposition,** and solid electrolyte interphase **(SEI) formation.**

Hyphenated EC-Raman is a **non-invasive technique** making it **ideal** to investigate changes occurring at the **electrode-electrolyte interface.**

Metrohm Hyphenated EC-Raman Battery Solution

The **Metrohm Hyphenated EC-Raman Battery Solution** makes it easy to get started, see instant results, all with an instrument you can upgrade as your research progresses.

Includes the **Autolab Trigger cable** that synchronizes and controls spectra acquisition through the NOVA software.

Autolab modular **PGSTAT302N** with an **Electrochemical Impedance Spectroscopy (EIS)** module included.

- A powerful **high compliance** modular potentiostat/galvanostat with current ranges from 10 nA to 1A.
- **Future-proof** your research with the ability to add up to **7 additional modules** post-installation.

B&W Tek **i-Raman Plus 532H System** features the **unique combination** of **wide spectral coverage** and **high resolution**.

- With a **532 nm laser** for higher Raman **scattering efficiency** and the possibility to **enhance** the **signal** (SERS)
- **Small**, **lightweight** Raman system with **fiber-optic** sample probe for versatile measurement of different sample types.

Choose the option that is right for you

B&W TEK RAMAN VIDEO MICROSAMPLING SYSTEM (532 NM)

Can **accommodate** a variety of cells up to **30 mm high**

- A **video camera** provides **real-time sample observation** and coaxial **LED illuminator** for **precise** laser alignment.
- Two objectives for **macro** and **micro** perspective (20x & 50x).

B&W TEK RAMAN PROBE HOLDER

Can **accommodate large** battery-dedicated **EC-Raman** cells

- **XY axis** positioning adjustment to obtain **Raman spectra** from **anywhere** on the sample.
- **Coarse** and **fine Z** axis adjustment for optimal focus.

DO YOU ALSO NEED A DEDICATED CELL?
Your local **Metrohm** sales representative can help you **create a customized sample cell** for your specific research requirements.

Ready-to-go when you are

HIGHLIGHTS

- Electrochemical workstation with **high accuracy EIS included**.
- Two editable **hyphenated Raman procedures** for the **NOVA** software, as well as the **BWSpec** software for extended **data analysis**.
- **Ready-to-go** solution that is **simple** to use.

TECHNIQUES AND METHODS

- **Raman spectroscopy** with fiber-optically coupled probe
- Electrochemical **SERS** (surface-enhanced Raman spectroscopy)
- Electrochemical **SHINERS** (Shell-isolated nanoparticles-enhanced Raman Spectroscopy)

MATERIALS

- **Carbonaceous materials:** graphene, nanotubes, graphene oxide, graphite, etc
- **Inorganic compounds:** transition metal oxides for Li-ion battery application
- **Organic molecules:** (electrolyte decomposition, SEI formation)

Expand your EC-Raman Battery Solution with battery-dedicated modules such as:

- A **high frequency impedance spectroscopy** (ECI10M) module which offers a standard frequency of **10 MHz**, perfect for solid-state batteries.
- **Increase** your applied current from 2 A with a **Booster** of either **10 A** or **20 A**.

SPECIFICATIONS

PGSTAT302N with EIS module		
Potential range		± 10 V
Compliance voltage		± 30V
Maximum current		± 2 A
Current ranges		10 nA to 1 A
Bandwidth		1 MHz
EIS frequency range		10 µHz - 1 MHz
i-Raman Plus 532H		
Laser	Wavelength	532 nm excitation
	Power	30 mW nominal (at exiting probe)
	Power Control	0 to 100% (adjustable at 1% increments)
Detector	Type	High quantum efficiency CCD Array cooled at -2° C
	Integration Time	100 ms - 30 mins
Spectrometer	Range	65 – 3400 cm^{-1}
	Resolution	< 3.5 cm^{-1} @ 614 nm
BAC151, Raman Video Microsampling System - 20x objective included		
Travel in Z direction		24 mm
XY Stage		Double Layer Mechanical Stage
XY Stage Size		150mm x 140mm
Travel in X/Y direction		75 mm (X), 50 mm (Y)
Video Microscope Objective, 20x		
Working distance		12.0 mm
Numerical aperture (NA)		0.3
Video Microscope Objective, 50x (RML150A)		
Working distance		9.15 mm
Numerical aperture (NA)		0.55
BAC150B, Raman Probe Holder		
Travel in Z direction		90 mm (5 µm resolution)
XY Stage		Double Layer Mechanical Stage
XY Stage Size		180 mm x 150 mm (X x Y)
Travel in X/Y directin		16 mm (+/- 8 mm from the center, with 10 µm resolution)

CONTACT YOUR LOCAL
METROHM SALES REPRESENTATIVE

Metrohm

ORDERING INFORMATION

Instruments & Accessories	
AUT302N.S	PGSTAT302N
FRA32M.MAC.204.S	Electrochemical Impedance Spectroscopy (EIS) module
BWT-840000360	i-Raman Plus 532H
BWT-840000962	BAC151, Raman Video Microsampling System - 20x objective included
BWT-840000325	Video Microscope Objective - 50x (RML 150A)
BWT-840000395	BAC150B, Raman Probe Holder
3500003120	Trigger cable for PGSTAT302N Hyphenated EC-Raman Solutions