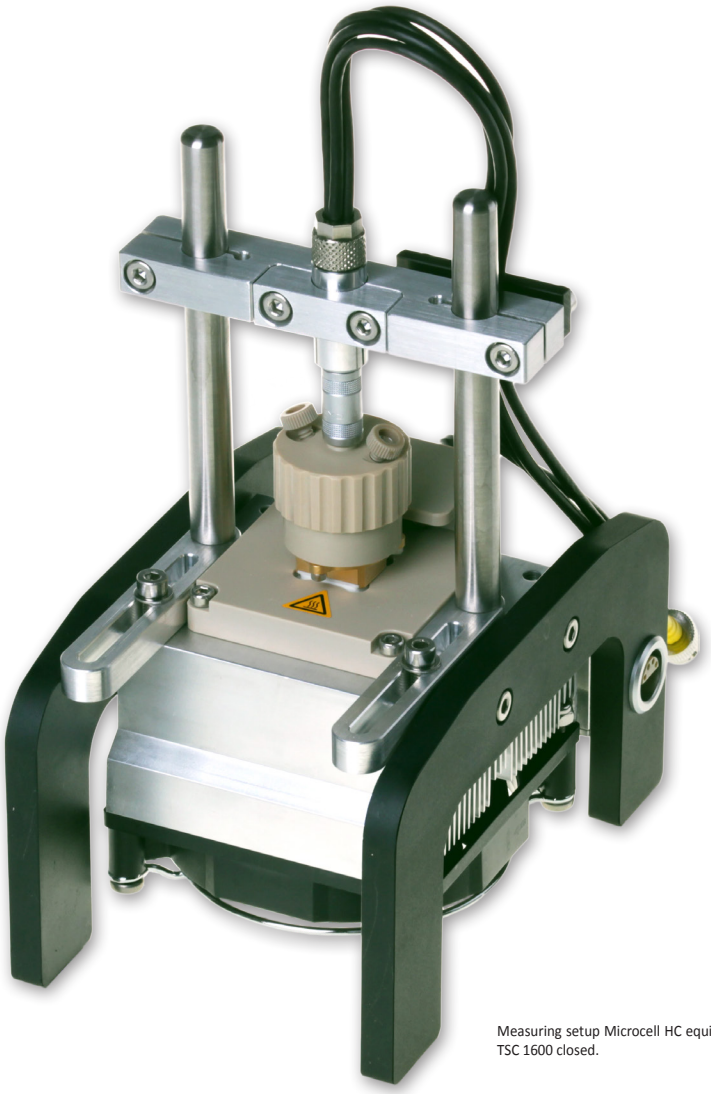
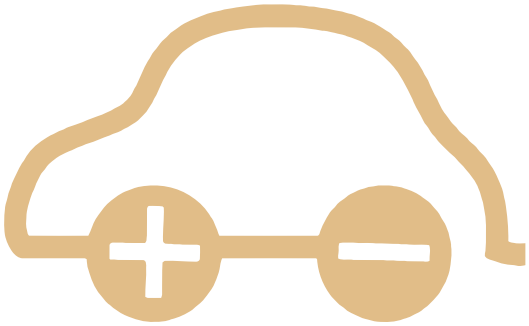
Electrochemistry - served hot and cold



Measuring setup Microcell HC equipped with TSC 1600 closed.

How can we make energy storage systems like capacitors and batteries become more efficient? How can we increase the lifetime of these devices, especially the lifetime of batteries? Which parameters are adequate for monitoring the performance of devices while being connected to a load?



flexible cell solutions for your electrochemical research

All of these questions can only be answered, if all the materials contained as single parts as well as their interplay are thoroughly studied to obtain a clear picture of all mechanisms contributing to the device's functionality. For doing so, classical and modern electrochemical analysis tools can be applied and combined with further methods like different kinds of spectroscopy.

Being part of this seminal development, rhd instruments is committed to supporting electrochemists and material scientists around the globe by designing and producing high-quality measuring setups for electrochemical material characterization with temperature control.

Liquid, gel-like, polymeric and solid samples can be investigated as well as heterogeneous samples, like half and full cells of lithium batteries containing components of different aggregation states. In all cases, a very small amount of sample, in some cases only few milligrams, is required. Due to this small sample amount and modern Peltier technique, the temperature can precisely be adjusted to the desired value within very short time.

The combination with high-quality measuring devices of METROHM provides the user with the unique opportunity of embedding temperature control in almost fully automated electrochemical material characterization and can be seen as a turn key system.

rhd instruments
flexible cell solutions

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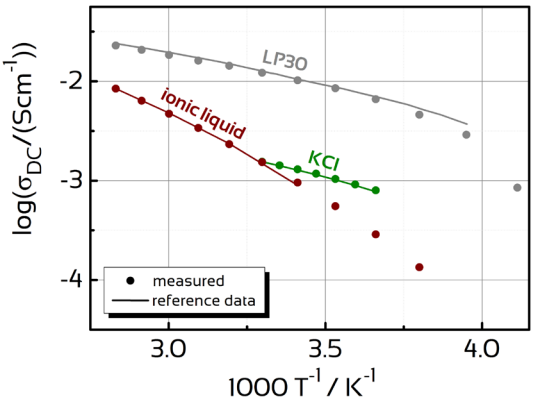
Main Features:

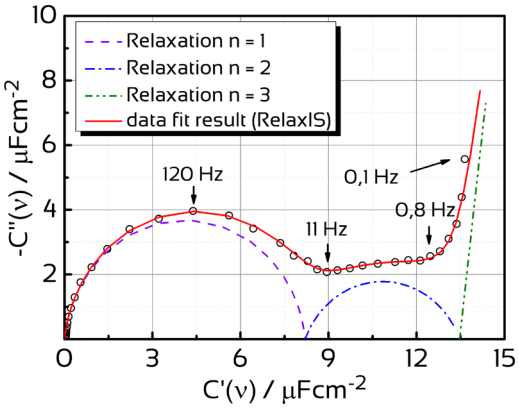
- Modular and flexible concept: easy and quick switchover between measuring cells for different applications.
- Large temperature range from -40 °C to +100 °C (depending on samples‘ mass and ambient conditions).
- Precise temperature control with tolerance of 0.1 °C.
- Fast temperature ramps up to 60 °C/min.
- Measurement of air- and/or moisture-sensitive samples (inside and outside a glove-box!).
- Small sample volumes of min. 70 µL to max. 1.6 mL (depending on measuring cell).
- Compatible to all major brands’ electrochemical measuring devices.
- Turn key system and fully-automated measurements with METROHM Autolab devices.

TSC 1600 closed

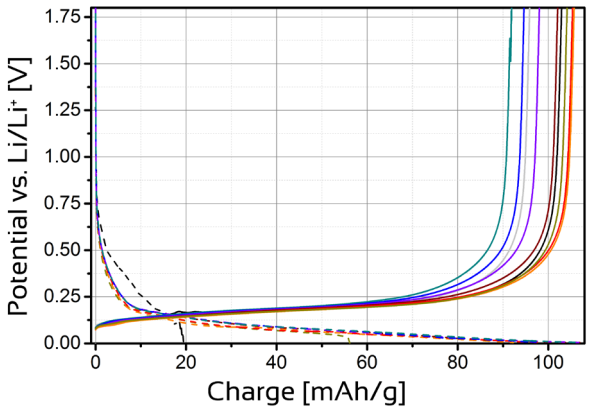


Temperature dependent dc-ion conductivity data of three different electrolytes depicted as Arrhenius plot measured using **measuring cell TSC 1600 closed** for liquid samples.

TSC surface

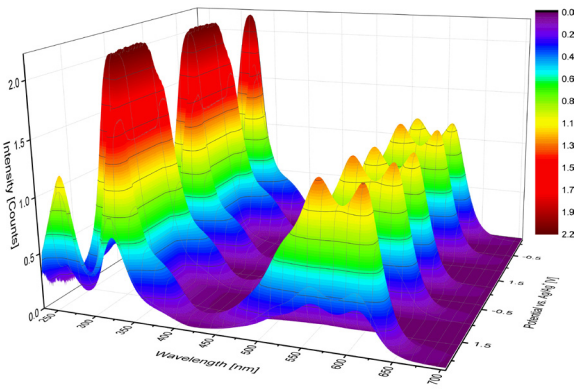


Investigation of the electrochemistry of solid/liquid interfaces using **measuring cell TSC surface** for investigation of solid samples, surfaces and solid/liquid interface studies.



Charge-discharge curves of a graphite half cell measured using **measuring cell TSC battery**.

TSC battery



UV/Vis spectra recorded during spectroelectrochemical investigation of TMPD dissolved in 0.25 mol/l Bu_4NPF_6 in acetonitrile using **measuring cell TSC spectro**. The potentials depicted on the y-axis mark the vertex potentials in the CV.

TSC spectro

Selected Applications

- Fully automated determination of the temperature dependent dc-ion conductivity of battery electrolytes.
- Battery cycling and determination of transfer numbers.
- Investigation of separator foils (MacMullin number).
- Determination of the electrochemical window of liquid electrolytes.
- Studies of organometallic complexes, DSSC or OLED dyes.
- Investigation of the temperature and potential dependent electrochemical double layer structure and dynamics.
- Corrosion studies.
- Spectroelectrochemistry (UV/Vis, transmission).