EL-CELL®

electrochemical test equipment

Electrochemical Dilatometer **ECD-1**

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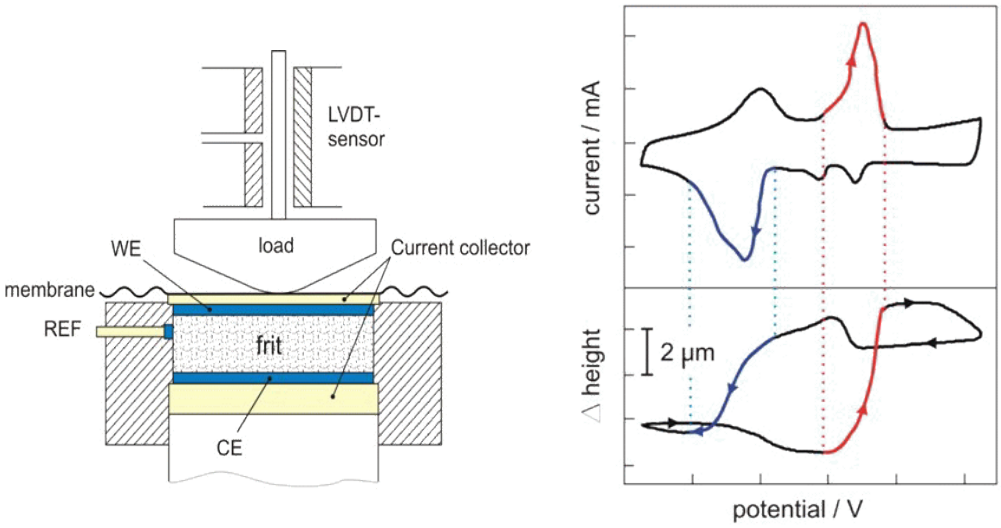
The ECD-1 is a research grade instrument dedicated to the measurement of charge-induced strain (expansion and shrinkage) of electrodes down to the sub-micrometer range. The ECD-1 is particularly developed for the investigation of Li-ion battery and other insertion-type electrodes. It may be used in organic as well as aqueous electrolyte solutions. The ECD-1 is the result of more than 10 years experience in the field.

The heart of the ECD-1 is an electrochemical cell, hermetically tight against ambient atmosphere. The two electrodes inside are separated by a stiff glass frit that is fixed in position. The upper (working) electrode is sealed by means of a thin metal membrane, through which any charge-induced height change is transmitted towards the sensor/load unit above.



Left: Dilatometer working principle. Right: Current response and height change of layered Ruthenium oxide HRO in 2 M H_2SO_4 during slow scan voltammetry. Courtesy of Prof. Wataru Sugimoto, Shinshu University, Japan.

A high-resolution displacement transducer detects dimensional changes ranging from 20 nanometers up to 500 micrometers, during one and the same experiment that may last between a few seconds to many days. A simple weight serves to adjust the load on the working electrode. Its potential can either be controlled against the counter electrode (cell voltage control) or against an additional reference electrode.

Typical Configurations:

- **ECD-1 Basic:** the ECD-1 dilatometer equipped for aprotic electrochemistry (dilatometer cell, sensor, and sensor-controller with dc-voltage output 2 to 10 V). Construction materials in media contact are titanium and PEEK. The user has to provide all peripheral equipment like data acquisition system, temperature chamber, and potentiostat.

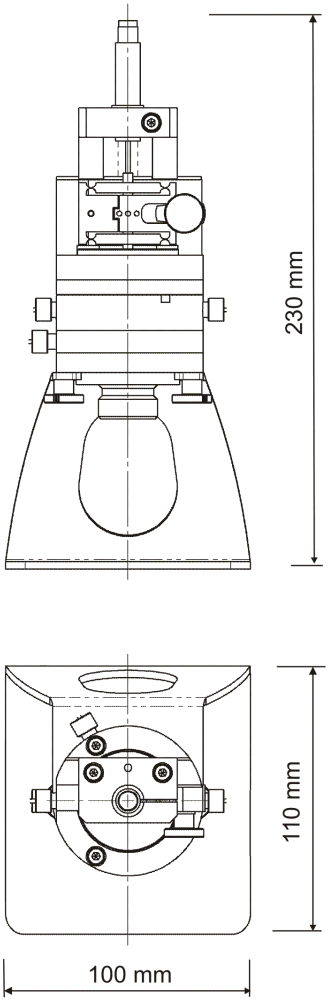
- **ECD-1 Standard:** includes the above Basic version PLUS the Agilent 34970A datalogger (incl. software) to record the sensor voltage together with up to 21 additional signals.

- **Upgrade Kit Aqueous:** replaces titanium parts by gold parts and thus makes the ECD-1 compatible with aqueous electrochemistry.

We can offer many other configurations, depending on your needs and budget, including parallel set-ups. Please contact us for specific requirements.

ECD-1 Main Characteristics:

- 500 micrometers full range with 20 nm resolution (LVDT sensor, 2 to 10 Vdc output signal)
- Choice between many different electrode types: bound films (up to 10 mm in diameter, up to 1 mm thick), binder-free powders or single crystals (optional)
- High chemical compatibility by proper choice of construction materials (standard is titanium or gold for the current collectors, PEEK for the cell housing, and EPDM for the seals)
- Small cell volume (ca. 3 ml electrolyte required)
- Low drift of height signal for long-term experiments (drift <0.1 micrometer per hour)
- Easy-to-assemble, easy-to-handle, and robust construction
- Choice of load on working electrode (30 and 130 g)
- Broad temperature range, -20 to +80°C, when used in combination with a temperature controlled chamber
- Modular design allows for separate electrolyte filling (e.g. inside a glove box) independent of dilatometer operation (e.g. inside a temperature chamber)



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