EChem Software (ES260)

Description

EChem™ software runs on Windows or Macintosh computers for the collection, display and analysis of data from electroanalytical voltammetric experiments. EChem is used with e-corder® data recording systems, and a potentiostat.

EChem is compatible with analog potentiostats that have an ‘external input’ and current and potential recorder outputs. EChem uses the e-corder hardware as the digital waveform generator, and data acquisition system. Even non-scanning potentiostats can often be upgraded to the full range of EChem techniques.

EChem is also fully compatible with the eDAQ Potentiostat (EA160) and the high sensitivity eDAQ Picostat (EA162).

Techniques

EChem supports the following electrochemical techniques:

- Linear (Staircase) Sweep Voltammetry (LSV)
- Normal Pulse Voltammetry (NPV)
- Square Wave Voltammetry (SWV)
- Differential Pulse Voltammetry (DPV)
- Cyclic (Staircase) Voltammetry (CV)
- Differential Pulse Amperometry (DPA)

All voltammetric techniques are also supported in stripping mode. Chronoamperometric/coulometric/potentiometric techniques are supported by the standard e-corder Chart and Scope software.

EChem also features a Multi Pulse Voltammetry technique where you can design a potential waveform using a staircase ramp with up to two pulses per step. Experiment with new techniques such as Cyclic Square Wave Voltammetry!

GLP

EChem is designed to help you with good laboratory practice:

- All runs are date and time stamped.
- Parameters used for any run can be recalled.
- Store sample preparation notes, standard addition concentrations, and general observations in the data file.
- Data is saved to hard disk after every run in ‘autosave’ mode, and can be recovered in the event of a power outage.
- Up to 999 runs can be stored in the one data file.
- Transfer files between Windows and Macintosh computers.

Data can be displayed as a graph of I versus E...

...or as I and E versus time. A baseline can be positioned for the measurement of current.
**View Modes**

Display current or potential on the X or Y axis, or plot current and/or potential versus time. You can reverse the direction of the current and potential axes to suit your convention.

**Data Pad**

The Data Pad is an internal mini-spreadsheet that helps analyze your data by locating peak positions, heights, areas, and more.

**Transform Data**

Functions include smoothing, integrating or differentiating data. The potential axis can be offset to display results against a different reference [for example work with a Ag/AgCl electrode, then display data against a SHE reference]. The raw data is always maintained internally and can be recovered.

**Export Friendly**

You can export raw voltammograms (as graphics or tabular data), and peak reports to other graphing software, word processors, and spreadsheets.

**Digital Signal Processing**

EChem gives the highest quality data possible from your potentiostat by averaging the current signal over a ‘sampling period’ for each data point displayed. The signal-to-noise ratio improves by a factor of \(\sqrt{n}\) when ‘n’ readings are averaged. In practice, where noise has been a problem, signal quality often improves by an order of magnitude, or more.

Signal averaging is performed at 32 bit floating point resolution which means that results from differential techniques (SWV, DPV, and DPA) are no longer limited by the system digital resolution.

**Computer Requirements**

EChem requires Windows 98, 2000, Me, XP, or MacOS 8.6 or later. The computer should have a minimum 128 MB RAM, and a USB port (2.0 or 1.1) to collect data.

**Specifications**

- Recording speeds: 0.1, 1, 10, 100 kHz
- Signal resolution: 16 bits
- Signal averaging resolution: 32 bit floating point
- Scan rates: < \(10^{-5}\) to ~500 V/s
- Step width: 0.01 ms minimum
- Input ranges: ±2 mV to ±10 V (adjust to potentiostat output)
- Waveform output ranges: ±1, ±5, ±2, ±1 V
- Output resolution: 16 bits
- Number of readings per sampling period: 65000 maximum
- Number of data points in one run: 16000 maximum
- Number of runs in one file: 999 maximum

**Ordering**

EChem software can be ordered as individual licenses (ES260) or as a departmental license (ES261).

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EChem techniques are selected from a pull down menu

Parameters for each technique are easily entered

The potential waveform for an EChem technique can be previewed before the experiment is commenced

Results from an anodic stripping voltammetry experiment. Highlighted area viewed in zoom window.

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Cyclic voltammetry of Ferrocene Carboxylic Acid (FCA). Sweeps with increasing scan rate overlaid

Cyclic voltamogram of FCA using a 1 µm microelectrode and EA162 Picostat.

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