epsilon™
Electrochemistry

epsilon is a revolutionary new family of potentiostats/galvanostats designed to allow the user great flexibility in choosing their particular instrument. The most basic epsilon instrument can be used for standard techniques, as well as chronopotentiometry, making it ideal for the teaching lab or for materials characterization (e.g., characterization of transition metal complexes by cyclic voltammetry and controlled potential electrolysis, or of biosensors by cyclic voltammetry and constant potential amperometry). Pulse, square wave, and stripping techniques can be added by a software upgrade, and a second channel can be added by a hardware upgrade.

Features

- Potentiostat, galvanostat and potentiometer
- PC-controlled
- Windows® multiple document interface
- Optically isolated circuitry for noise reduction
- RS-232 connection
- Control of BASi accessories such as cell stands (C3, CGME, and RDE-2)
- Bipotentiostat option
- Wide current range
- Peak finding routine (auto and manual)
- File subtraction
- File overlay
- Positive feedback iR compensation
- Initiate experiments at open circuit potential
- Internal dummy cells for hardware self-test and troubleshooting
- Analog filters - automatic and manual control
- 50/60 Hz selection for noise minimization
- Digital smoothing
- Data file conversion to various text formats, including DigiSim® compatible format
- IUPAC/Polarographic conventions

BASi

30 Years of Innovation
www.bioanalytical.com

Techniques

Basic

Cyclic Voltammetry and Linear Sweep Voltammetry
Scan rate: 1 mV/s - 10 V/s
Step height: 100 μV
Peak analysis - tailing (peak potential and current reported)
Optional software: DigiSim digital simulation

Chronoamperometry/Chronocoulometry
Single or double potential step
Step time: 1 ms – 65 s
Cottrell plot analysis (slope, intercept, and
    correlation coefficient reported)
Digital integration of current for charge vs time
Anson plot analysis (slope, intercept, and
    correlation coefficient reported)
Resolution: ‡ 20 μs

Controlled Potential Electrolysis
Electrolysis termination by time
High resolution 20-bit data
Data acquisition rate up to 20 Hz
Optional auto termination by minimum current,
    final/initial current ratio or total charge

DC Potential Amperometry
High resolution 20-bit data
Data acquisition rate up to 20 Hz

Chronopotentiometry
Potential resolution 20 μV
High resolution 20-bit data
Data acquisition rate up to 20 Hz
Optional auto termination by potential

Open Circuit Potential vs. Time
Potential resolution 20 μV
High resolution 20-bit data
Data acquisition rate up to 20 Hz

Basic Plus Option

Sampled Current Polarography
Staircase waveform

Normal Pulse Voltammetry/Polarography
Easy to change pulse width, period (drop time) and
    current sampling parameters

Differential Pulse Voltammetry/Polarography
Easy-to-change pulse width, period (drop time) and
    current sampling parameters
Measurement of peak potential and current

Square Wave Voltammetry
Fastest of the common quantitative analysis techniques
Excellent detection limits
User-selectable frequency, amplitude, and current sampling
Square wave frequency: 1 Hz - 2000 Hz
Measurement of peak potential and current

Stripping Voltammetric Techniques
Combination of deposition (preconcentration) step
    followed by voltammetric (stripping) step
Linear sweep, differential pulse, and square wave
    voltammetries available for stripping step
Capable of anodic, cathodic, and adsorptive stripping
    determinations
Measurement of peak potential and current with auto or
    manual definition of baselines

Double Potential Step Chronopotentiometry
Minimum step time: 1 ms
Current range: ± 32 mA
Resolution: ‡ 20 μs
Potential resolution: 20 μV

Bipotentiostat Option

Multichannel Amperometry
Constant potential amperometry on two channels
Data acquisition up to 20 Hz
High resolution 20-bit data

Multichannel Cyclic Voltammetry
Both electrodes scanned identically
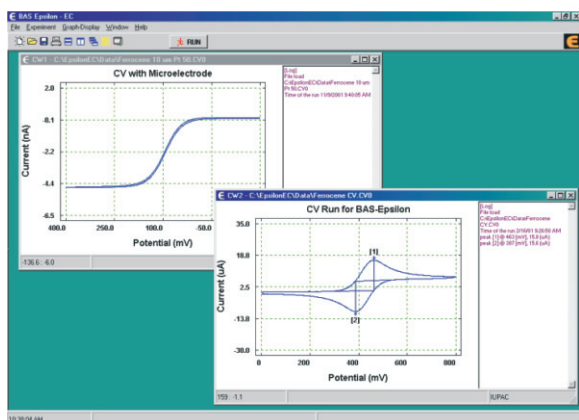Scan Electrode 1 and Constant Potential Electrode 2

Multichannel Chronoamperometry
Both electrodes stepped identically
Step Electrode 1 and Constant Potential Electrode 2

Methods Option
Sequential Techniques
Sequence up to 6 techniques
Insert delays and trigger in sequence
Auto-repeat sequence up to 999 times

Specifications

Potentiostat
Compliance voltage: ±12 V (Channel 1)
Applied potential: Dynamic DAC:
   16 bit, ±3.275 V @ 0.1 mV resolution
Offset DAC: 8 bit, ±2.55 V @ 10 mV resolution
Maximum current: 100 mA
Bandwidth: > 100 kHz
Bias current: < 1pA
Electrometer input impedance: > 10^{12} W

Galvanostat
Applied current: 1 nA - 50 mA
Range: ±10 V
Measured potential resolution: 0.02 mV
Maximum leakage current: 30 pA

Current-to-voltage Converter
Full scale sensitivity:
   1 nA*, 10 nA*, 100 nA, 1 µA, 10 µA, 100 µA,
   1 mA, 10 mA, 100 mA (*secondary gain used)
Filter (2 pole Bessel): 0.1, 1.0, 10, 100, 1.0 k, and 10 kHz
Secondary gain: x1, x10, and x100
Bandwidth: >100 kHz
ADC resolution: 16 bit
Sampling rate: 50 kHz (20 µs/conversion)
Data length: 32k points – fast

I/O
Analog: E_{out}, I_{out}, and E_{in}
Cell Stand port (control of C3 Cell Stand and CGME)
Accessories port (RDE-2 control)
PC (RS-232) port
Trigger out: start and end of run
Trigger in: start run

Minimum PC Requirements
Windows 98, Me, 2000 or XP
300 MHz Pentium II (Pentium III or higher recommended)
64 MB RAM
10 MB hard drive space available
Dedicated serial port
CD-ROM drive

Power Requirements
100/120/220/240 V
50/60 Hz
120 W

Dimensions and Weight
16.75" (43 cm) X 5.25" (13 cm) X 12.75" (32.5 cm)
1 channel - 20.2 lb. (9.2 kg)

C3 Cell Stand

The C3 Cell Stand is a general-purpose accessory for electroanalytical experiments. It provides a base to support the cell vial and a mounted cell top to hold the electrodes. The base also contains a magnetic stirrer, and there are lines for inert gas purging. Stirring and gas purging are available by remote control by BASi EC ∈psilon. The standard package contains all accessories needed to run basic electrochemistry experiments.

CGME

The CGME is a mercury drop electrode that can be used as a Dropping Mercury Electrode (DME), a Static Mercury Drop Electrode (SMDE) (e.g., for polarography), and a Hanging Mercury Drop Electrode (HMDE) (e.g., for anodic stripping voltammetry). The mercury drop is grown by opening a fast-response valve, and drop size is determined by the length of time the valve is open, which allows a wide range of drop sizes.

RDE-2

The BASi RDE-2 is a rotator system for both fixed rotation rate and hydrodynamic modulation rotating disk electrochemical experiments. Rotation rates from 50 to 10,000 RPM are available with better than 1% accuracy. The rotator unit is manually raised and lowered, and can be inverted for spin-coating. Rotation functions can be controlled remotely using a BASi EC ∈psilon, or manually.

∈psilon Pricing: www.bioanalytical.com

BASIC INSTRUMENT
e2   Electrochemical Analyzer
e2P Electrochemical Analyzer with PC

CHANNEL OPTION
0   Single Channel
2   Bi-Potentiostat

SOFTWARE PACKAGE OPTION
0   Basic Software Package
1   Basic Plus Package
2   Methods Option
3   Both Basic Plus and Methods Option

CELL STAND OPTION
1   C3 Cell Stand
2   CGME
3   Both C3 and CGME
0   No Cell Stand

RDE (ROTATING DISK ELECTRODE) OPTION
1   RDE-2
0   No RDE-2

DIGITAL SIMULATION SOFTWARE OPTION
1   DigiSim
0   No DigiSim

FUTURE OPTIONS
0   Future Options

For Example: e2-011100 is an ∈psilon Electrochemical Analyzer with a Single Channel, and includes the Basic Plus Package, C3 Cell Stand, and RDE-2.

echem@bioanalytical.com

BASi
BIOANALYTICAL
SYSTEMS, INC
2701 KENT AVENUE
WEST LAFAYETTE
INDIANA 47906
765.463.4527
FAX 765.497.1102
WWW.BIOANALYTICAL.COM

∈psilon and DigiSim are registered trademarks of Bioanalytical Systems, Inc.