GAMRY INSTRUMENTS

Redefining Electrochemical Measurement

Interface 1010T Potentiostat/Galvanostat/ZRA and Starter Pack

If you're new to electrochemical techniques or perhaps are teaching an analytical chemistry course and want to incorporate a couple electrochemical techniques, we have the ideal potentiostat and accessory kit for you.

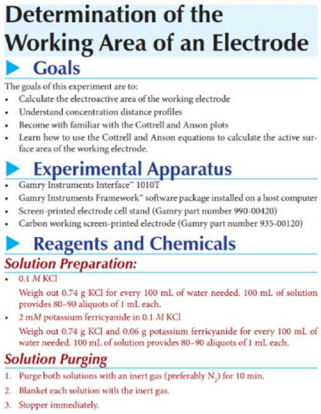
The *Interface 1010T Potentiostat/Galvanostat/ZRA and Starter Pack* is designed to help people understand and start making measurements sooner. The kit includes:

- Interface 1010T Potentiostat/Galvanostat/ZRA
- Five experiments
- Student and Teacher's manuals (digital)
- Cells and electrodes

Experiments have been chosen to help you learn a variety of techniques from cyclic voltammetry to pulse techniques to corrosion techniques and even electrochemical impedance spectroscopy.

Experiment	Goal
Cyclic Voltammetry	Determine the redox potential and diffusion coefficient of potassium ferricyanide.
Determination of Working Area of an Electrode	Calculate the electroactive area of the WE. Understand concentration distance profiles. Familiarization with the Cottrell and Anson equations
Comparison of Pulse Techniques	Compare different pulse techniques. Determine amount of copper in an unknown water sample.
Corrosion of Mild Steel at different pHs	Determine the corrosion rates for mild steel at different pHs.
Electrochemical Impedance Spectroscopy	Perform EIS on a network of resistors and capacitors. Model EIS data using an equivalent circuit to extra resistor and capacitor values.

Our student and teacher manuals are ideally laid out with goals of each experiment, necessary equipment, reagents and chemicals (including instructions for preparation).


Determination of the Working Area of an Electrode

Goals

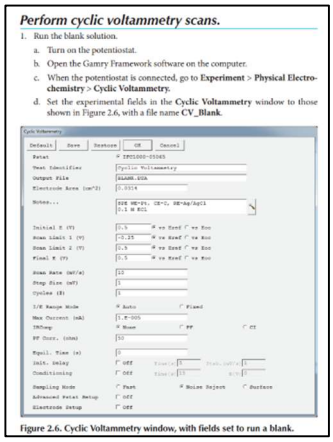
The goals of this experiment are to:
- Calculate the electroactive area of the working electrode
- Understand concentration distance profiles
- Become with familiar with the Cottrell and Anson plots
- Learn how to use the Cottrell and Anson equations to calculate the active surface area of the working electrode.

Experimental Apparatus
- Gamry Instruments Interface™ 1010T
- Gamry Instruments Framework™ software package installed on a host computer
- Screen-printed electrode cell stand (Gamry part number 990-00420)
- Carbon working screen-printed electrode (Gamry part number 935-00120)

Reagents and Chemicals

Solution Preparation:
- 0.1 *M* KCl
  Weigh out 0.74 g KCl for every 100 mL of water needed. 100 mL of solution provides 80–90 aliquots of 1 mL each.
- 2 m*M* potassium ferricyanide in 0.1 *M* KCl
  Weigh out 0.74 g KCl and 0.06 g potassium ferricyanide for every 100 mL of water needed. 100 mL of solution provides 80–90 aliquots of 1 mL each.

Solution Purging
1. Purge both solutions with an inert gas (preferably N_2) for 10 min.
2. Blanket each solution with the inert gas.
3. Stopper immediately.

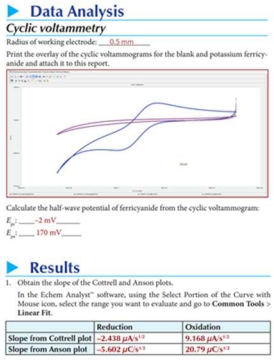

Perform cyclic voltammetry scans.

1. Run the blank solution.
   a. Turn on the potentiostat.
   b. Open the Gamry Framework software on the computer.
   c. When the potentiostat is connected, go to **Experiment** > **Physical Electrochemistry** > **Cyclic Voltammetry**.
   d. Set the experimental fields in the **Cyclic Voltammetry** window to those shown in Figure 2.6, with a file name **CV_Blank**.

Figure 2.6. Cyclic Voltammetry window, with fields set to run a blank.

We also include detailed step-by-step procedures to help you become familiar with operation of the instrument and software. This helps keep the focus on learning the material versus having to simultaneously learn the software.

Each manual also includes questions regarding data analysis while the teacher's manual includes the expected results of the experiments as shown on the right. You can see what each student should be seeing and also what they should be calculating in their data workup.


Data Analysis

Cyclic voltammetry

Radius of working electrode: 0.5 mm

Print the overlay of the cyclic voltammograms for the blank and potassium ferricyanide and attach it to this report.

Calculate the half-wave potential of ferricyanide from the cyclic voltammogram:

E_{pc} ____-2 mV____

E_{pa} ____170 mV____

Results

1. Obtain the slope of the Cottrell and Anson plots.
   In the Echem Analyst™ software, using the Select Portion of the Curve with Mouse icon, select the range you want to evaluate and go to **Common Tools** > **Linear Fit**.

	Reduction	Oxidation
Slope from Cottrell plot	-2.438 $\mu A/s^{1/2}$	9.168 $\mu A/s^{1/2}$
Slope from Anson plot	-5.602 $\mu C/s^{1/2}$	20.79 $\mu C/s^{1/2}$

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Upgrade to a full Research-Grade Potentiostat

The Interface 1010T can be upgraded to a fully-capable research-grade potentiostat at any time. The in-field upgrade allows you to go from an Interface 1010T to an Interface 1010E, growing in capabilities as your needs grow.

System Information

Ordering information	PN
Interface 1010T Potentiostat/Galvanostat/ZRA with Starter Pack	992-00171

This starter pack is configured using a number of our standard cell kits and electrodes. Below is a list of the individual components contained within the system.

Item	Part Number	Quantity
Interface 1010T	992-00126	1
Screen-printed electrode stand	990-00420	1
Carbon WE SPE	935-00120	6
PTC1 Paint Test Cell (w/o RE)	990-00197	1
Mild steel sample	820-00141	2
1 uF capacitor	240-00015	1
2.2 uF capacitor	240-00017	1
20 ohm resistor	100-00040	1
100 ohm resistor	100-00011	1

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