

Reference Electrode Performance Evaluation

Overview

Occasionally, electrochemical experiments can yield unpredictable data from excess noise, overloads, oscillations, and spikes in the measured signal, amongst other issues. If there is a problem with your measured cell response, consider following the troubleshooting steps found on Gamry's website. After calibration and eliminating connection issues, running the problematic experiment in a 2-electrode configuration can evaluate the reference electrode's performance.

This guide will detail the process of setting up a 2-electrode experiment and suggest corrective action if a problem is found.

*Note – This guide is only applicable for electrochemical cells that utilize a reference electrode.

Running the Experiment

The typical lead connections for a 3-electrode configuration (figure 1b) consist of a Working Electrode, Reference Electrode and Counter Electrode. Each electrode corresponds to a designated color on the Gamry Cell Cable, shown below.

When troubleshooting problematic data, modifying a single variable is the best way to isolate the problem. Try to maintain the same electrochemical cell conditions including electrode materials, electrolyte, etc. Remove the reference electrode from the setup and make the following connections (figure 1a):

1. Leave the Working and Working Sense leads (Green and Blue) connected to the working electrode

2. Leave the Counter lead (Red) connected to the counter electrode
3. Connect the Reference lead (White) to the counter electrode

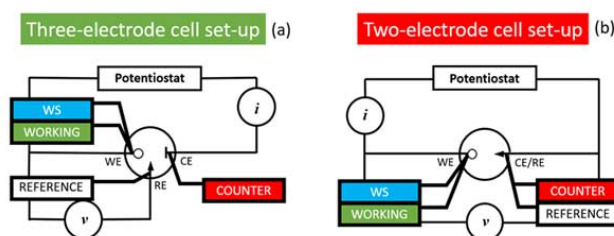


Figure 1 - (a) Three-electrode lead connection diagram. (b) Two-electrode lead connection diagram

Finally, run the experiment with the same setup parameters in Gamry Framework.

Performing Analysis and Next Steps

When the experiment is complete, compare the data sets between the two runs. If there is an improvement in the measurement, consider running an Impedance Measurement on your reference electrode. This can help to confirm that the electrode needs maintenance or replacement.

The guide for Reference Electrode Care will cover the steps needed to improve the performance of the reference electrode, including changing the filling solution and changing the frit.

A Special Note for Bridge Tubes

A bridge tube, or double junction can introduce a large impedance into a system. If there is improvement in the 2-electrode experiment, and

the reference electrode falls within an acceptable impedance, consider evaluating the impedance of the reference electrode with the bridge tube.

No Improvement

If the problem persists, gather the files from the problematic run, the 2-electrode experiment, and the calibration report and send them to techsupport@gamry.com. Include a description of your experimental setup and we would be happy to suggest additional troubleshooting steps.

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