Standard Operating Procedures

Potentiostat

Potentiostats are very useful for energy research. A potentiostat can perform many various functions on an electrode-based system, as it is a source of power and of power measurement. For this reason, potentiostats also pose some safety and instrument risks. This SOP has been developed to address these safety and instrument risks. Safety risks are those associated with hazards to the operator and/or others in the nearby vicinity. Instrument risks are those associated with compromise or destruction of the instrument.

Using the Potentiostat

1. Note the labeling of the electrode system. The labeling is different for all potentiostats. The working, counter, and reference electrode leads should all be identified by the user manual for the applicable potentiostat. Sometimes, working-sense and counter-sense leads are required as well. These can be clamped directly to the corresponding clamps for the respective electrode, i.e. working-sense attached to working.

2. Prepare the electrode system desired for testing. If this is an electrochemical system, ensure there is sufficient ion concentration to support the conductivity required for the experiment. Usually 10 mM is sufficient in aqueous systems while organic solvents may require higher concentrations.

3. Ensure the electrodes you are using are not corroded and are conductive. This can be accomplished using a common multimeter in test mode. Test mode provides a BEEP when the leads from the multimeter are touched onto a conductive surface.

4. After the electrodes are secured in place, connect the appropriate leads to the respective electrodes. Connect the ground electrodes (commonly black) to a metal surface away from the experiment. IF A REFERENCE ELECTRODE IS NOT BEING USED FOR THE EXPERIMENT simply connect the reference electrode lead to the counter electrode lead. In experiments without a reference electrode, the counter electrode acts as the reference against which the potentiostat applies control of the working electrode.
5. DOUBLE CHECK that the electrode leads are not touching any metal or each other. This can lead to shorting and possibly sparks, which in the presence of organic electrolytes can cause ignition.
6. Conduct the electrode experiment.
7. Disconnect the leads and leave the area in a neat and organized manner. Clean any liquids that may have spilled.

Safety and Instrument Risks Associated with Potentiostats

1. Never touch the electrodes while conducting an experiment. While the voltages and currents associated with laboratory potentiostats are not typically high, adverse reactions can occur.
2. Always ensure the electrodes do not touch metal or each other. This can lead to shorting and overloading of the potentiostat, which can cause complete malfunction.
3. If the voltage is very high when you begin an experiment (i.e. greater than 2 V), it is very likely (a) the electrodes you are using are experiencing high resistance either because of corrosion or poor contact, (b) the reference electrode is not connected, or (c)

the reference electrode is malfunctioning as a result of poor storage, leakage, or air bubbles.