

Electrochemistry— Demonstration Summaries and Concepts



Microscale Electrolysis—The Rocket Reaction

When electricity is passed through a solution of water containing an electrolyte, hydrogen gas and oxygen gas are obtained. In this microscale demonstration, the gas mixture is collected in a pipet bulb by water displacement and then ignited with a spark. The resulting “bulb rocket” shoots across the room, proving that the electrolysis gas mixture contains the 2:1 stoichiometric ratio of hydrogen and oxygen.



Hoffman Electrolysis—Color Enhanced!

Use the Hoffman apparatus—a great demonstration device—to illustrate the basic principles of electrochemistry. The presence of an indicator adds color and helps students see what’s going on. What reaction occurs at the anode versus the cathode? What ions are produced at each electrode? Quantitative principles of electrochemistry can also be demonstrated with the proper equipment.



The Tin Man—Tin(IV), Tin(II), and Tin(0)

Grow a beautiful “tin-man” crystal tree by running an electric current through a solution of tin(II) chloride! Tin(II) ions are oxidized to tin(IV) ions at the anode and are reduced to tin(0) metal at the cathode.

Orange Juice Clock—Electricity from a Chemical Reaction

Students are always looking at the clock anyway, but this demonstration will really get them looking—and wondering! Build an electrochemical cell using orange juice and copper and magnesium metal electrodes. The resulting spontaneous oxidation–reduction reaction generates enough electricity to run a battery-powered clock. Use this demonstration to jump-start your lesson plans!

Basic Electrophoresis—Migration of Ions in an Electric Field

One of the most poorly understood concepts in electrochemistry has to do with the flow of electricity in an electrochemical cell. Electrons carry electricity through the external circuit, but ions carry the current through the solution. A central feature of electrochemical cells, ion migration in an electric field is also the basic principle in electrophoresis. Watch charged dye molecules move in opposite directions in this quick and easy introduction to electrophoresis.

Lemon Battery Contest—Metal Activity and Cell Potentials

Design your own battery using strips of different metals and a lemon or an orange. Good luck! What is the largest voltage that can be obtained in a lemon battery? Use the results obtained with different metals to deduce the reaction that takes place in a lemon battery.



Concepts

- Electrolysis
 - Oxidation–reduction
 - Decomposition reaction
 - Combustion reaction
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- Electrolysis
 - Oxidation–reduction
 - Anode vs. cathode
 - Current, coulombs, electrons
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- Electrolysis
 - Oxidation–reduction
 - Anode vs. cathode
-
- Electrochemistry
 - Cell potential
 - Metal activity
 - Anode vs. cathode
-
- Electrophoresis
 - Migration of ions
 - Positive and negative electrodes
-
- Electrochemistry
 - Cell potential
 - Metal activity
 - Anode vs. cathode