

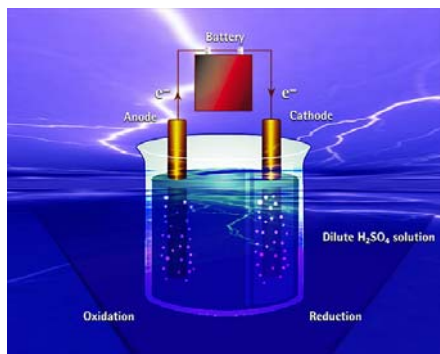
#9655

ELECTROLYSIS & CORROSION

LANDMARK MEDIA, 2001

Grade Levels: 9-12

12 minutes



DESCRIPTION

Experiments demonstrate the electrolysis of copper sulfate and the factors leading to corrosion. Other demonstrations focus on the chemical reactions of iron nails in water, sulfuric acid, sodium hydroxide, sodium chloride, and air.

► ACADEMIC STANDARDS

Subject Area: Science – Physical Science

- ★ Standard: Understands the structure and properties of matter
 - Benchmark: Knows that substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties (See Instructional Goal #2.)
 - Benchmark: Knows factors that influence reaction rates (e.g., types of substances involved, temperature, concentration of reactant molecules, amount of contact between reactant molecules) (See Instructional Goal #4.)
 - Benchmark: Knows that a large number of important reactions involve the transfer of either electrons (oxidation/reduction reactions) or hydrogen ions (acid/base reactions) between reacting ions, molecules, or atoms (See Instructional Goal #3.)

INSTRUCTIONAL GOALS

1. To show how an electrolysis cell works.
2. To demonstrate the electrolysis of an aqueous solution of copper (II) chloride.
3. To explain what happens in an oxidation-reduction reaction.
4. To show the way in which iron corrodes in different environments.

VOCABULARY

- | | |
|-------------------------|-----------------------------------|
| 1. electrolysis | 10. oxidized |
| 2. aqueous | 11. oxidation-reduction equations |
| 3. copper (II) chloride | 12. corrode |
| 4. direct current | 13. distilled water |
| 5. electrolysis cell | 14. sulfuric acid |
| 6. carbon electrodes | 15. sodium hydroxide |
| 7. ions | 16. sodium chloride |
| 8. anode | 17. passivated |
| 9. cathode | 18. rust |

BEFORE SHOWING

1. Review oxidation-reduction reactions.
2. Discuss the terms "rusting" and "corrosion". Can they be used interchangeably or do they have different meanings?

DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause at the section showing the chlorine gas forming bubbles at the anode. What other characteristic of chlorine gas will help identify it?
3. Pause at the section showing the copper collecting at the cathode. Why is the substance black?
4. Pause at the section showing the corrosion of the steel nails. Why are changes seen above the level of liquid?



AFTER SHOWING

► Discussion Items and Questions

1. What is electrolysis?
2. What is the name of the blue solution used in the electrolysis experiment?
3. What is an electrolysis cell?
4. What kind of direct current is used in the experiment?
5. Where do the negative ions travel to? Where do the positive ions go?
6. What happens to the chloride ions at the positive electrode? What happens to the copper ions at the negative electrode? What is the oxidation-reduction equation for this process?
7. What is meant by corrosion?
8. What is in the five test tubes that are set up for this experiment?
9. What happens to the steel nails in each test tube after three days? After six months? Which test tube showed the least corrosion? The most corrosion?
10. What other metallic bodies can be destroyed by corrosion over a long period of time?
11. How can the surface of the metal be protected against corrosion?

► Applications and Activities

1. Research and report on different kinds and shapes of electrolysis cells. Draw a sketch of each and determine the advantages and disadvantages of each.
2. In the video, carbon electrodes were used. Research and report on what other kinds of electrodes may be used.
3. Make an illustration to show what happens at the anode and the cathode during electrolysis.
4. Research other solutions that can be used in an electrolysis experiment. (Examples include tin chloride, potassium iodide, and potassium chloride.)
5. Make a chart and write descriptions of the changes in each of the test tubes in the video after three days and after six months.

6. Make a list of possible ways to prevent corrosion of nails. Conduct an experiment similar to the one in the video to see if it works. Suggestions include covering the nail with Vaseline, varnish, paint, and cooking oil.
7. Research and report on electroplating and its uses.
8. Research and report on methods used to prevent corrosion on bodies of cars and ships.
9. Research the restoration process that the Statue of Liberty underwent in 1984 to preserve the metallic surfaces.
10. Obtain samples of aluminum nails, stainless steel nails, electroplated nails, and galvanized nails. Report on how these nails are able to resist rusting.
11. Research the process of galvanization. Illustrate each step of the process.

RELATED RESOURCES

- [Acids and Bases #3098](#)
- [Chemical Reactions #3112](#)



World Wide Web

The following Web sites complement the contents of this guide; they were selected by professionals who have experience in teaching deaf and hard of hearing students. Every effort was made to select accurate, educationally relevant, and "kid safe" sites. However, teachers should preview them before use. The U.S. Department of Education, the National Association of the Deaf, and the Captioned Media Program do not endorse the sites and are not responsible for their content.

• CHEMISTRY DEMOS: CORROSION

<http://www.iserv.net/~chargers/chem/secdcorrosion.htm>

Contains an illustrated laboratory experiment on corrosion. Includes a list of materials, the procedure, questions, and explanations.



• CHEMISTRY MERIT BADGE EXPERIMENT

<http://cyberbuzz.gatech.edu/axsigma/bsa/experiment.htm>

Contains an experiment that demonstrates the techniques that prevent iron from rusting.

• ELECTROLYSIS

<http://www.physchem.co.za/Redox/Electrolysis.htm>

Includes information and illustrations about electrolysis such as what it is and why it is important. Also has interactive examples and a section on electroplating.

• LINKS TO CHEMISTRY EXPERIMENTS, DEMONSTRATIONS



http://www.chemistrycoach.com/Links%20to%20chemistry_experiments.htm

Has a long list of sites that contain lectures, demonstrations, and experiments related to topics in chemistry. Includes experiments on electrolysis and corrosion.