

B. Color Me Gold

The plater uses his talents to beautify as well as to protect metal. A good and graphic example of this is *anodizing* aluminum metal. Because this metal has low density, is relatively strong, and is plentiful, it has become widely used for toys, decorations, airplanes, and buildings.

Aluminum oxidizes much more slowly than iron.

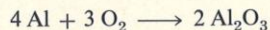


The Aluminum Association

INVESTIGATION 11

5. What is oxidation in iron commonly called?

Aluminum oxidizes slowly and the products of the oxidation help protect it from further oxidation.



Anodizing is a form of plating which colors the thin layer of aluminum oxide which coats the surface of the aluminum.

What You Need

Aluminum (Al) sheeting,
3 cm × 8 cm

Aluminum (Al) sheeting,
10 cm × 12 cm

Ammonium oxalate
[(NH₄)₂C₂O₄],
1 M solution

Detergent

Iron(III) chloride

(FeCl₃), 1 M solution

Methyl alcohol (CH₃OH)

Sulfuric acid

(H₂SO₄), 2 M

Beakers, 250 ml, 2

Beaker, 400 ml

Graduated cylinder,
100 ml

Stirring rod

Alligator clips, 4

Asbestos pad

Burner

Forceps

Insulated wire,
ends stripped, 2

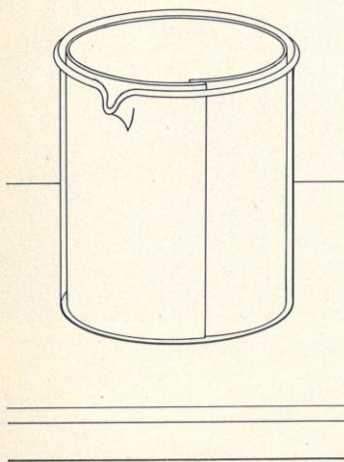
Matches

Power supply, 6 V. D.C.

Ring

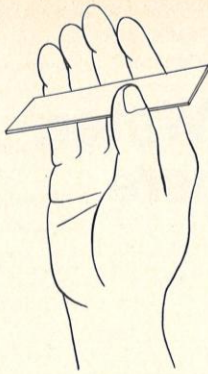
Ring stand

Safety goggles



What to Do

- Wrap the larger piece of aluminum around the 400 ml beaker to make a cylinder.
 - Fit it into the 400 ml beaker so that it acts as a liner.
 - Add 300 ml of 2 M H₂SO₄ to the beaker.
 - Using alligator clips, attach a wire between the large piece of aluminum and the negative terminal of the power source.
6. Will this piece of aluminum act as the cathode or the anode?
- Thoroughly clean the smaller piece of aluminum with detergent, rinsing it thoroughly in cool running water. Handle this piece of aluminum only by the edges. Place it in alcohol until ready for use.



- f. Using alligator clips, attach a wire to the smaller aluminum strip and loop it over the ring so that the strip hangs in the beaker of acid. **Caution: The two pieces of aluminum should not touch each other.**
- g. Attach the smaller strip of aluminum to the positive pole of the power source. Within a few seconds a stream of bubbles will be seen rising from the cylinder of aluminum. This indicates all is well.
- h. Allow the current to flow at least 10 minutes.
- i. As you disconnect the center piece of aluminum from the positive pole, quickly remove it from the beaker.

Remember, this piece should be handled only by the edges.

- j. Thoroughly rinse this aluminum under a stream of running tap water.
- k. Using your forceps, immerse this piece of aluminum into a solution of equal parts of 1 M FeCl_3 and $1\text{ M (NH}_4)_2\text{C}_2\text{O}_4$. Allow the strip of aluminum to remain in the solution for 15 seconds.
- l. Remove and rinse in running water.

Note the color.

- m. To seal in this color, immerse the anodized plate into boiling water for 1–2 minutes.

Anodizing is a graphic example of how a protective coating can be made decorative.

