2018

Electroplating Pennies Lab

Jacob W. Doehring
Parkland College

Electroplating Pennies
Jacob Doehring

A with Honors
Chemistry 102-003
Professor Manuel Rodriguez
5/17/18

For my project, I experimented with electroplating a common penny with zinc. This experiment used the chemistry of electroplating to chemically attach zinc to the penny. I set up my experiment as shown below:

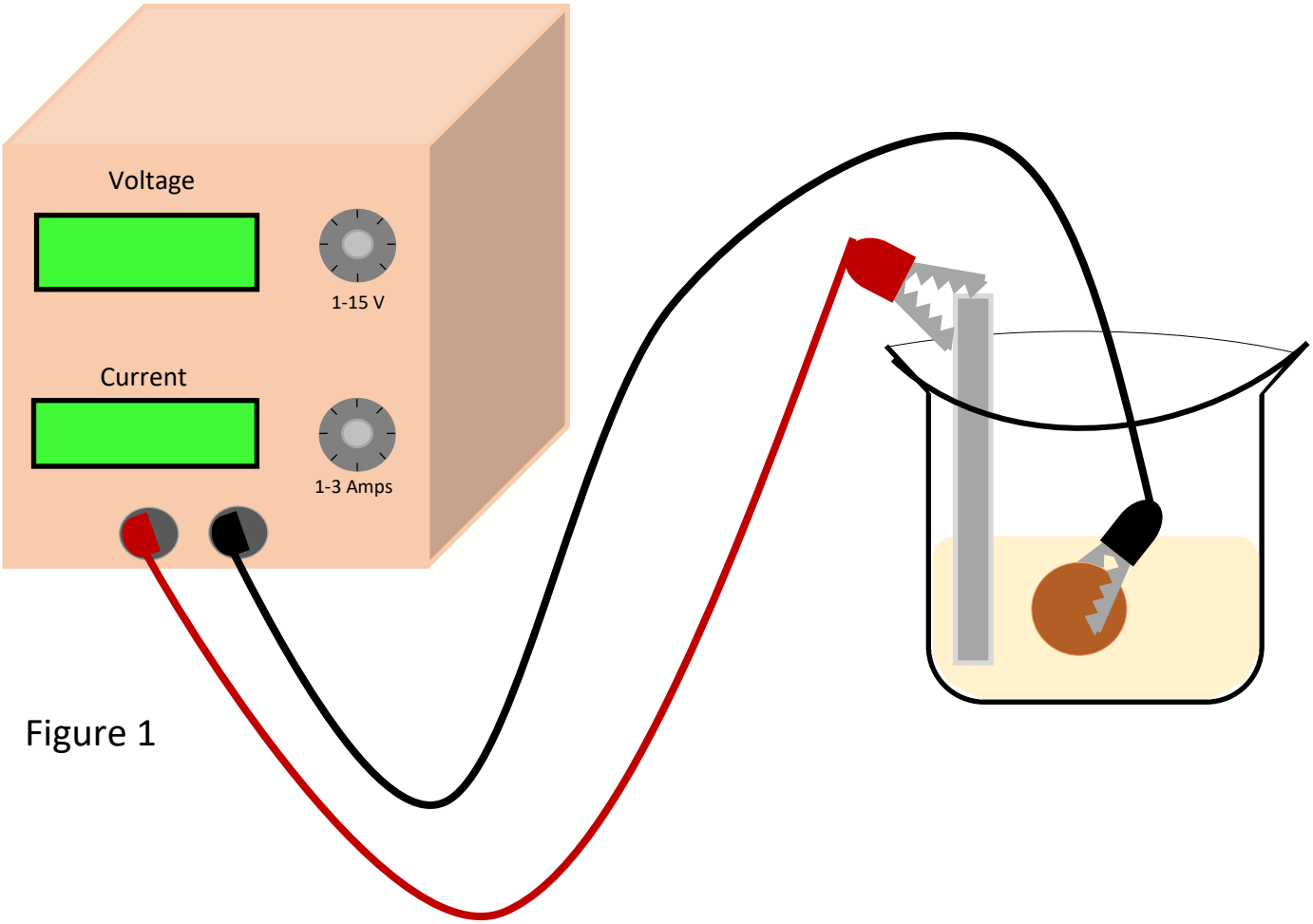

Figure 1

Background:

Electroplating is the process where a metal is coated onto an object through an electrical current. In our example, we have a zinc anode, a zinc solution, and a copper cathode. By choosing the metals in this order, we have determined that our copper electrode will be electroplated with zinc. The zinc ions in the solution are positively charged. The copper cathode

has a negative charge and allows a flow of electrons to flow into the cathode. These electrons attract the positively charged zinc ions which chemically bonds the zinc onto the copper penny.

This method is used today in various ways, one of the more common being chrome plating hubcaps on cars. This same process is used in jewelry to coat less valuable metals with a thin layer of gold or silver.

The goal of this lab is to electroplate a copper penny with zinc using a current and creating a cell system. Also, to experiment with varying voltages and currents and analyzing how these fluctuations affect the system.

Materials used:

- Zinc rod
- Penny
- Alligator clips
- Power supply
- Zinc ($ZnSO_4 * 7H_2O$)
- Something to hold alligator clamps elevated (so as not to fall into solution.
- 250ml beaker
- 250ml volumetric flask
- Voltmeter (if power supply doesn't already show voltage and current)

Procedure:

Part 1, Making the Solution

To make the solution, weigh out 71.887g of $ZnSO_4 * 7H_2O$ on a balance. Put the zinc into a 250ml volumetric flask. Add distilled water into volumetric flask up to 250mL. Mix solution thoroughly until completely dissolved. This takes a really long time to stir so solution might need to be prepared before students start the lab.

Part 2, Assembling the system

To assemble the system shown above, start by transferring the zinc solution made before into a 250ml beaker. The precise amount doesn't matter as long as the solution comes into contact with both the penny and the zinc.

Next, hook up the correct alligator clips to the zinc and the penny. The red alligator clip (the positive end) hooks up to the zinc rod (the anode). The black alligator clips (the negative end) hoops up to the penny. Make sure both of these clips, the other end, are inserted into the correct corresponding colored sockets on the power supply. Figure 1 shows how the system should look.

Part 3 A., Running the Experiment

(If using a battery that doesn't show voltage, skip to Part 3 B.)

Start by turning the power supply on. The top knob adjusts the voltage and the bottom, the current. There is a light bottom left of both knobs. When adjusting current and voltage, you want to keep the top light green and make sure the bottom light doesn't remain red. The green light shows that you have a correct voltage to current ratio. If the red light is on, you have an imbalance of current to voltage and need to turn the voltage down.

Test using different variations of voltage and current. Record the values used and how these different variations change the effects on the penny

In conclusion, we were able to use electrochemistry to chemically change the electrons within an anode to attach to a cathode, thus creating a film of metal on our penny. My experimentation resulted in an even coat of zinc onto the metal penny. I noticed that the greater the voltage and current, the reaction proceeded much quicker, but the coating was much less evenly laid out. By turning the voltage down and the current down, the reaction proceeded much slower but resulted in a much better coat of zinc on the penny

What Is Electroplating? Definition and Meaning." *BusinessDictionary.com*, Web Finance Inc., www.businessdictionary.com/definition/electroplating.html.

FuseSchool, director. *How Does Electroplating Work*. Fuse School, 17 May 2016, www.youtube.com/watch?v=OxhCU_jBiOA.