



CAUTION: ALL CHEMICALS ARE IRRITANTS. CuSO_4 IS TOXIC AND AN IRRITANT. WEAR PERSONAL PROTECTIVE EQUIPMENT AT ALL TIMES. IF THE CHEMICALS COME IN CONTACT WITH SKIN, FLUSH THE AFFECTED AREA FOR 15 MINUTES, AND CONSULT A HEALTHCARE PROFESSIONAL IF ANY CHEMICALS ARE INGESTED. CONSULT YOUR LAB TECHNICIAN WHEN DISPOSING OF CHEMICALS. DAMAGED OR EXPOSED WIRES CAN CAUSE SHOCKS. HANDLE WITH CARE.

Unit 3, Topic 2: Use an electrolytic cell to carry out metal plating.

Source: *Chemistry 2019 v1.3 General Senior Syllabus* © Queensland Curriculum & Assessment Authority

Aim

The purpose of this experiment is to observe and measure the effects of electroplating copper onto a copper cathode.

Materials

- 60 mL 1 M CuSO_4 solution
- 2 × copper strips (approx. 7 cm × 3 cm)
- 50 mL acetone
- Wash bottle with deionised water
- DC power supply
- 2 × 100 mL beakers
- 200 mL waste beaker
- 2 × wires with crocodile clips
- Sheet of emery paper
- Electronic balance
- Stopwatch

Method

- 1 Use the emery paper to clean the electrodes. Wash them with the wash bottle. Fill a 100 mL beaker with acetone and dip the electrodes into it. Allow the electrodes to air dry.
- 2 Weigh both electrodes by using the balance and record their mass in Table 1. Make a note of the one you will use as the anode and cathode.
- 3 Pour 60 mL of 1 M CuSO_4 into a 100 mL beaker and add the electrodes.
- 4 Connect the cathode to the negative terminal of the power supply and the anode to the positive terminal, using the wires with crocodile clips (see Figure 1).

Note: It may be easier to curve the electrode around the mouth of the beaker so that it is hooked onto its side. In this way, the electrodes will not touch one another and remain a constant distance apart.

- 5 Turn the settings of the power supply to 8 V. Ensure that the stopwatch is ready to start timing. Turn the power supply on and start timing for 10 minutes.
- 6 Turn the power supply off and disconnect the electrodes.
- 7 Remove the cathode and use the wash bottle to wash the copper sulfate solution remaining on the electrode into the waste beaker. Add acetone to the 100 mL beaker and dip the cathode into the beaker, allowing it to air dry.
- 8 Once completely dry, use the balance to weigh the electrode and record its mass in Table 1.
- 9 Repeat Steps 7 and 8 with the anode.

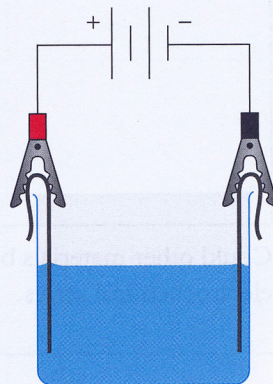


FIGURE 1 Experimental set-up of an electroplating cell

Results

Record your results in Table 1 below.

TABLE 1 Results of the electroplating cell

Electrode	Mass of the electrode (g)		
	Before electrolysis	After electrolysis	Change in mass
Cathode			
Anode			

Discussion

- 1 Compare the mass difference in the anode and cathode.

- 2 Write a fully labelled cell diagram with half- and overall equations to demonstrate the processes occurring within the electrolytic cell.

- 3 Could other materials be used as the anode or cathode? Explain your answer using the electrochemical series.

- 4 Could another solution have been used as the electrolyte? Explain your answer.
