Galvanic Cells

Purpose

To show the basic principles of a galvanic cell.

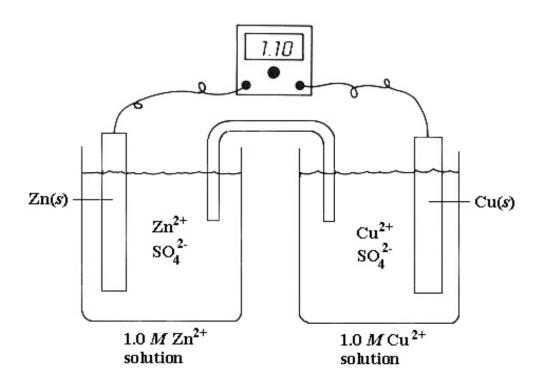## Materials

copper electrode (plate)	1 M ZnSO$_4$
zinc electrode (plate)	1 M CuSO$_4$
2 250 mL beakers	Clear voltmeter for overhead projector
Salt bridge made of kimwipe soaked in saturated KNO$_3$	

Procedure

1.   Set up the cell as in the picture below with the voltmeter on the overhead projector.

2.   Properly assembled the voltmeter should read approximately 1.10 V.

Additional Information

1.   Other solutions and electrodes can be substituted.

2.   The half-reactions are:

$$\mathcal{E}°(V)$$

$$Zn^{2+} + 2\ e^- \rightarrow Zn \qquad\qquad -0.76$$

$$Cu^{2+} + 2\ e^- \rightarrow Cu \qquad\qquad 0.34$$

The overall reaction is:

$$\mathcal{E}_{cell}$$

$$Zn + Cu^{2+} \rightarrow Cu + Zn^{2+} \qquad 1.10\ V$$

3.   Application of the Nernst Equation can be shown by changing the concentration of the solutions.

$$\mathcal{E}_{cell} = E^o_{cell} = \frac{0.0592}{n} \text{ at } 25°C$$

Questions for the Students

1.   Which is the anode and cathode?

2.   Which direction do the electrons flow?

3.   What is the purpose of the salt bridge?

Disposal

Solutions should be placed in properly labeled storage containers. Electrodes can be cleaned with 1M HCl.

Reference

University of Illinois, Urbana-Champaign.

Electrochemistry 2