

THEORY

When a metal is immersed in a solution of its own ions, an equilibrium is established between the metal and its ions. This is the basis of the Daniell cell. The cell consists of two half-cells. The first half-cell contains a zinc electrode immersed in a solution of zinc ions. The second half-cell contains a copper electrode immersed in a solution of copper ions. The two half-cells are connected by a salt bridge containing an electrolyte like potassium sulfate. The zinc electrode is the anode and the copper electrode is the cathode. The overall cell reaction is:

$$Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$$

PROCEDURE

1. Preparation of solutions: Weigh a precise amount of zinc sulfate and copper sulfate and dissolve them in distilled water in two separate beakers. The concentrations should be the same, say 0.1 M.

2. Electrode preparation: Clean the zinc and copper electrodes with sandpaper and dilute hydrochloric acid to remove any surface impurities. Rinse them with distilled water.

3. Cell assembly: Place the zinc electrode in the zinc sulfate solution and the copper electrode in the copper sulfate solution. Connect the two solutions by a salt bridge containing potassium sulfate solution.

4. Measurement: Connect the two electrodes to a voltmeter. Measure the open-circuit potential difference between the two electrodes. This is the EMF of the cell.

RESULTS

The measured EMF of the Daniell cell is approximately 1.1 V.

DISCUSSION

