To Study the Variation Of Cell Potential In $Zn \mid Zn^{2+} \parallel Cu^{2+} \mid Cu$ Cell With Change In Concentration Of Electrolytes ($CuSO_4$ & $ZnSO_4$) At Room Temperature

Theory

Reduction potential of an electrode increases with increase in concentration of the electrolyte.

$M^{n+}(aq) + ne^- \longrightarrow M(s)$
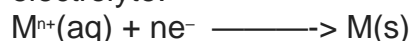
In the zinc-copper electrochemical cell zinc electrode acts as anode while copper electrode acts as cathode.

$$E_{cell} = E_{cathode} - E_{anode}$$

E_{cell} increases if $E_{cathode}$ increases and E_{anode} decreases. Thus, using higher conc. of Cu^{2+} and lower conc. of Zn^{2+} ions increase the E_{cell} of $Zn \mid Zn^{2+} \parallel Cu^{2+} \mid Cu$.

The relation between conc. of the electrolyte and the standard electrode potential is given in the form of Nernst equation :

$$E = E° - \frac{0.059}{n} \log \frac{[M]}{[M^{n+}]}$$

Apparatus and Chemicals

One beaker, a porous pot, connecting wires, milli voltmeter, sand paper, zinc strip, copper strip, 1 M $ZnSO_4$ solution and 1 M $CuSO_4$ solution.

Procedure

1. Take copper sulphate solution in a clean beaker.
2. Clean the copper strip with the help of sand paper and dip it into copper sulphate solution.
3. Take zinc sulphate solution in a porous pot.
4. Clean the zinc strip with the help of sand paper and dip it into zinc sulphate solution.
5. Keep the porous pot in the beaker.
6. Connect the copper strip with the positive terminal and zinc strip with the negative terminal of a voltmeter as shown in Fig.
7. Note the position of the pointer in the voltmeter and record the reading in your notebook.

Repeat the experiment by taking different concentrations of zinc sulphate and copper sulphate solutions.

Observation

Conc. of ZnSO₄ solution	Concentration of CuSO₄ solution	emf of the cell
1 M	1 M	 V
1 M	0.5 M	 V
1 M	0.025 M	 V
1 M	0.0125 M	 V
0.5 M	1 M	 V
0.025 M	1 M	 V
0.0125 M	1 M	 V

Conclusion

EMF of the cell increases with decrease in cone, of the electrolyte around anode and increase in cone, of the electrolyte around cathode.