(DC1-12) Faraday's Law of Electrolysis

Aim of experiment

Determination of the electrochemical equivalent weight of copper.

Apparatus

Battery – Two Copper Electrodes – Electrolytic Solution- Ammeter.

Theory of experiment

Liquids which are decomposed when an electric current pass through them are termed *electrolytes*, and the process of decomposition is called *electrolysis*.

When two similar electrodes are inserted into an electrolytic solution and a current is allowed to flow through the solution, the ions will tend to precipitate on the negative electrode.

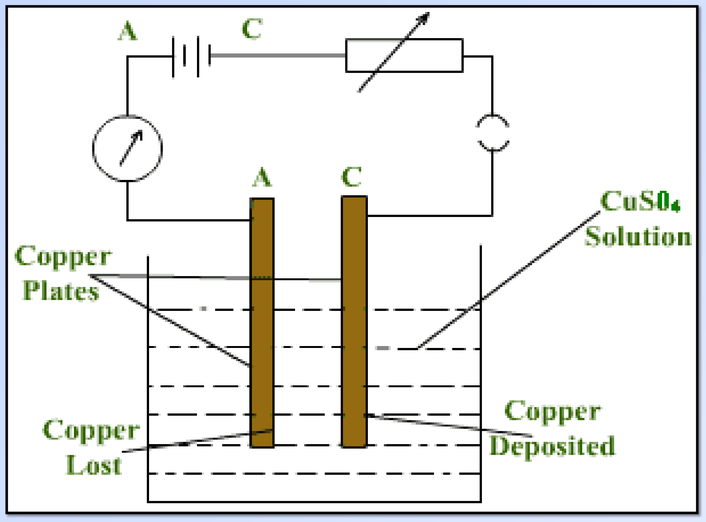

Figure 1 A schematic diagram of electrolysis circuit

The *electrochemical equivalent*, Z, of an ion is the mass in grams which is set free by the passage of unit quantity of electricity, Q. It follows from this definition that :

$$M = ZQ = ZIt,$$

Where M is the mass of precipitant ions on the negative electrode, I and t is the current passing through the electrolyte in time t

The quantity of electricity required to liberate one gram-atom of any univalent element is called Faraday, and the Faraday is equal to 96500 coulombs approximately. One gram-atom means the mass for which the number of grams is the same as the number representing the atomic mass of the element.

When a current of electricity is passed between copper electrodes through a dilute solution of copper sulphate in water, decomposition takes place, and copper ions are liberated from the anode and deposited on the cathode. If the mass deposited on cathode during the passage of electric current, I, in a time t, is measured then Z can be calculated.

Procedures

1. Measure the mass of the negative electrode, cathode, m_1.
2. Put the cathode in its place and allow a fixed quantity, at about 1A, of electricity to pass in the circuit using a potentiometer for about 20 min.
3. Use a cloth to dry the cathode and measure its mass, m_2.
4. Calculate the precipitant mass $M = m_2 - m_1$.
5. Find the value of electrochemical equivalent from the relation
$$Z = M / I t$$
6. Repeat steps 1 to 6 at least 3 times and calculate Z in each case.
7. Calculate the average value Z and the standard deviation ΔZ.

Results

I (A)	t(min)	m_1(g)	m_2(g)	M(g)	Z(g/A.s)
Z_{av}=			(g/A.s)		

$$Z_{av} \pm \Delta Z = \ldots\ldots\ldots \quad (g/A.s)$$

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