4- Determination of the Faraday

The faraday is the amount of electricity corresponding to one mole of electrons, and its value can be estimated by the electrolysis of

compounds.

A simple example is the electrolysis of copper sulphate solution between copper electrodes. The cathode reaction is:

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

thus 2 Faraday are required to deposit 1 mole of cupper.

Requirements

Electrical equipment, as in fig. 1.

The electrolyte is prepared by dissolving copper (II) sulphate pentahydrate in distilled water and adding concentrated sulphuric acid plus some milliliters of ethanol.

The electrodes consist of copper foil with a narrow tongue at one end for making electrical connections.

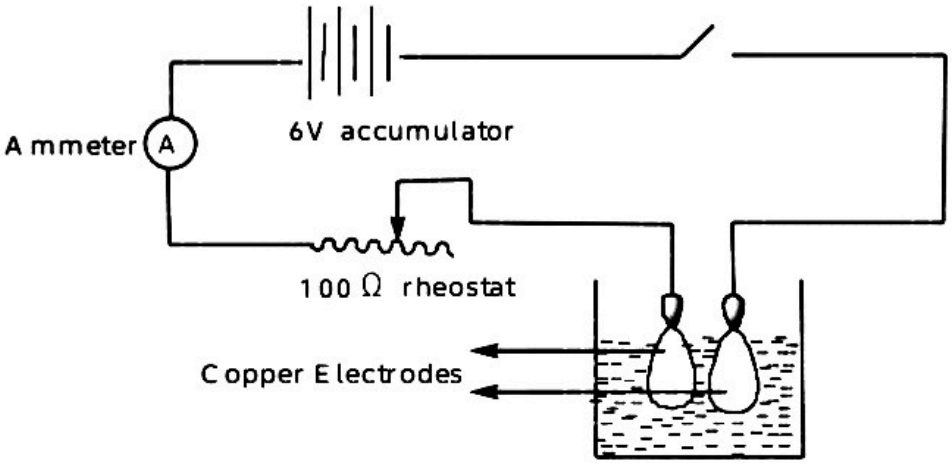

Fig.1

Then rinse well with pure water and ethanol before drying in an oven at 100 °. After cooling the cathode, weigh it accurately to the nearest milligrams.

(b) Set up the apparatus according to the circuit diagram (fig. 1) and have it checked before commencing the experiment. The variable resistor should be set to have maximum resistance in the circuit.

(c) Place the copper sulphate solution in a 150 ml beaker and dip in the electrodes.

(d) When all is ready, note the precise time and switch on. Quickly adjust the variable resistor so that the current flowing is about (10 mA). The resistance is adjusted as necessary to maintain constant current value.

(e) After about 20 minutes switch off the current, noting the precise time.

(f) Carefully remove the cathode, rinse with distilled water and ethanol, then dry. After cooling the cathode weigh it accurately to the nearest milligram.

Calculations From the relationship: $$F = \frac{I\,t\,A}{W\,Z}$$

F is the Faraday constant

I is the passed current in Amper

t is the time (sec)

A is the atomic weight of copper

W is the weight of deposited copper

Z is the equivalent number of copper.

Calculate the value of the Faraday in amp-hours, and also in amp-