Question # 82484

A current of 2A flows for 2 hours 40 minutes 55 seconds through a solution of copper sulphate in a platinum electrode.calculate:

a. how many faradays were consumed.

b. calculate the quantity of electricity passed.

c. what vlume of o2 gas would be liberated at the anode.

d. what happens tothe CuSO4 AT THE END OF THE ELECTROLYSIS

Solution:

The electrolysis of $CuSO_4$ provides according to the chemical equation:

$$2CuSO_4 + 2H_2O \xrightarrow{I} 2Cu + 2H_2SO_4 + O_2$$

a. During the electrolysis, it was consumed:

$$C = \frac{I * \tau}{F} = \frac{2 * (160 * 60 + 55)}{96485} = \frac{19310}{96485} = 0.2\ F$$

b. The quantity of electricity passed through a solution is equal to:

$$Q = I * \tau = 2 * (160 * 60 + 55) = 19310\ C$$

c. The volume of O_2 liberated at the anode is:

$$V(O_2) = \frac{22.4 * 2 * (160 * 60 + 55)}{4 * 96485} = 1.121\ l$$

d. At the end of electrolysis, the concentration of $CuSO_4$ is reduced. The liberated copper precipitates at the cathode, the concentration of obtained H_2SO_4 is maximal. If the cathode remains in the solution after power shutdown and the concentration of H_2SO_4 is high, the following reverse reaction occurs:

$$Cu + 2H_2SO_{4(concentrated)} = CuSO_4 + SO_2 + 2H_2O$$

Answer:

a. During the electrolysis, it was consumed 0.2 F (faradays).

b. The quantity of electricity passed through a solution is 19310 C (coulombs).

c. The volume of O_2 liberated at the anode is 1.121 l (liters).

d. At the end of electrolysis, the concentration of $CuSO_4$ is reduced. The liberated copper precipitates at the cathode, the concentration of obtained H_2SO_4 is maximal. If the cathode remains in the solution after power shutdown and the concentration of H_2SO_4 is high, the following reverse reaction occurs:

$$Cu + 2H_2SO_{4(concentrated)} = CuSO_4 + SO_2 + 2H_2O$$