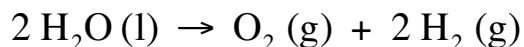


CONCEPT: ELECTROLYSIS

Electrolysis deals with passing an electrical current through a substance in order to produce chemical changes.

- The use of outside energy is indicative of a non-spontaneous reaction.

The passing of an electrical current through water helps to generate its standard components:



Electrical Current

The units for electrical current are in _____ (A):

moles of electrons

The moles of electrons within a reaction are determined by:

Ohm's Law

The Ohmic potential, E , is the voltage necessary to overcome resistance, R , when the current, I , is _____ flowing:

Overpotential is the voltage required to overcome the activation energy for a reaction at a given electrode.

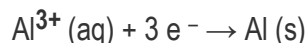
Concentration polarization occurs when there is a difference in the concentrations of reactants and products on the surface of electrodes when compared to the solution.

Electrolysis is made more difficult by *ohmic potential*, *overpotential* and *concentration polarization*.

$$E_{\text{Cell}} = E_{\text{Cathode}} - E_{\text{Anode}} - E_{\text{Ohmic}} - \text{Overpotentials}$$

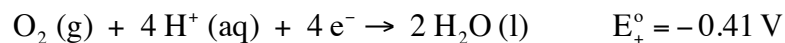
PRACTICE: ELECTROLYSIS CALCULATIONS 1

EXAMPLE 1: Aluminum can be electroplated at the cathode of an electrolysis cell by the half-reaction:



How much time would it take for 825 mg of aluminum to be plated at a current of 4.1 A?

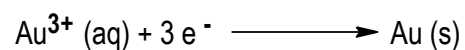
EXAMPLE 2: In the electrolysis of molecular iodine to iodide ions for 0.15 M NaI solution containing 4.2×10^{-4} M I_2 at a pH = 6.00 with $P_{\text{O}_2} = 1.25$ bar, calculate the voltage needed to drive the reaction.



PRACTICE: During electrolysis the concentration of I_2 increases to 8.3×10^{-3} M, while all other concentrations remain unchanged. If the electrical resistance is 1.8 ohms, the current is 71 mA, the anode overpotential is 0.013 V and the cathode overpotential is 0.115 V, what is the voltage needed?

CONCEPT: ELECTRICAL CURRENT

EXAMPLE 1: Gold can be plated out of a solution containing Au^{3+} based on the following half reaction:



a) What mass of gold is plated by a 41 minute flow of 6.8 A current?

EXAMPLE 2: A solution of Mn^{+5} is used to plate out Mn in an electrochemical cell. If a total of 1.13 g of Mn is plated out in a total time of 1600 seconds, what was the electrical current used? (**MW of Mn is 54.94 g/mol**)

