Answer on Question #75450 - Chemistry - Physical Chemistry

Question:

Discuss hittorf method of determination of transport numbers.

Solution:

The Hittorf Method

Every 1F of electricity causes dissolution and precipitation of 1 g-eq of metal, transfer $t_+ = (1- t_-)$ cations to the cathode and transfer $t_- = (1- t_+)$ anions to the anode.

As a result, in compartment I there is a loss of salt in quantity

$\Delta n_I = t_- Q/F$

in compartment III the same profit of salt, in compartment II the salt concentration is not changes.

Conditions for correct electrolysis:

1) absence of adverse reactions at the electrodes (100% yield on current)

2) no transfer of solvent (dilute solutions)

3) absence of diffusion equalization of concentration

4) hydrostatic equilibrium, absence of electroosmosis and other phenomena (low current, short time).

Compartment I - negative electrode, cathode, cathodic reduction proceeds

compartment III - positive electrode, anode, anodic oxidation proceeds

All three compartments are filled with a solution of the same concentration, and both electrodes are made of corresponding metal (for example, electrolyte $CuSO_4$, electrodes - copper).

The definition is based on Faraday's laws:

1) The amount of substance reacted on the electrodes, proportionally to the missed charge

2) The mass of the reaction product is proportional to its molar mass / chemical equivalent

$n = Q / F$

$F = 96485\ C\ mol^{-1}$.