

Kohlrausch law of independent migration of ions

The limiting molar conductivity of an electrolyte can be represented as the sum of individual contributions of cations & anions of that electrolyte.

If $\lambda_{Na^+}^{\circ}$ and $\lambda_{Cl^-}^{\circ}$ are limiting molar conductivities of sodium and chlorine ions respectively then the limiting molar conductivity of the sodium chloride is given by following equation

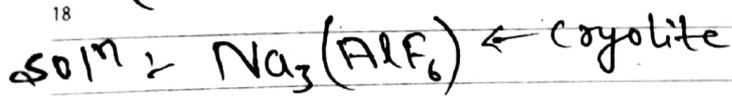
$$\lambda_{NaCl}^{\circ} = \lambda_{Na^+}^{\circ} + \lambda_{Cl^-}^{\circ}$$

Lunch

In general if an electrolyte on dissociation gives n^+ cations and n^- anions then its limiting molar conductivity can be given as follows:

$$\lambda_m^{\circ} = n^+ \lambda_+^{\circ} + n^- \lambda_-^{\circ}$$

(Q) Represent the limiting molar conductivity of cryolite (an ore of aluminium).



Sunday 07

$$\lambda_m^{\circ} = 3 \lambda_{Na^+}^{\circ} + \lambda_{(AlF_6)^{3-}}^{\circ}$$

Weak electrolytes \rightarrow Weak electrolytes like acetic acid have lower degree of dissociation at higher concentrations and change in λ_m with dilution is due to the increase in the degree of dissociation (α) . In such cases λ_m increases ~~slightly~~ **steeply** on

It is our shortcomings which can teach us all that is needed

dilution, especially near lower concentration.

At infinite dilution (when $C \rightarrow 0$) electrolytes dissociate completely (i.e., $\alpha = 1$). At any concentration C if α is the degree of dissociation then it can be represented as follows

$$\alpha = \frac{\lambda_m}{\lambda_m^\circ}$$

And using the value of concentration C and degree of dissociation α the dissociation constant of weak electrolyte like Acetic acid can be calculated as follows

$$K = \frac{C\alpha^2}{1-\alpha}$$

$$= \frac{C \left(\frac{\lambda_m}{\lambda_m^\circ} \right)^2}{1 - \frac{\lambda_m}{\lambda_m^\circ}}$$

$$= \frac{C \frac{\lambda_m^2}{\lambda_m^{\circ 2}}}{\frac{\lambda_m^\circ - \lambda_m}{\lambda_m^\circ}}$$

$$K = \frac{C \lambda_m^2}{\lambda_m^\circ (\lambda_m^\circ - \lambda_m)}$$