

Ionic strength

It is measure of Electrical intensity due to the presence of ions in the solution.

It is given by

$$I = \frac{1}{2} (m_1 z_1^2 + m_2 z_2^2 + \dots)$$

Where m_1, m_2, m_3, \dots are molalities
 C_i - concentration of ions

z_1, z_2, z_3^2, \dots are valences of various ions present in solution.

Ex - Calculation of Ionic strength

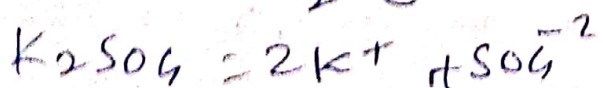
of (i) 0.15 m KCl solution

(ii) 0.25 m of K_2SO_4 solution

(iii) mixture of 0.1 m NaCl and

0.2 Na_2SO_4 solution.

$$I = \frac{1}{2} (0.15 \times 1^2 + 0.15 \times 1^2) = 0.15$$



$$I = \frac{1}{2} (0.8 \times 1^2 + 0.25 \times 2^2) = 0.75$$

Activity & Activity Coefficient of Electrolytes

The effective concentration of an ion or the electrolyte in a solution is called activity, it is usually denoted by a and given by

$$a = \gamma \times m$$

where m = molality
 γ = activity coefficient

$$\gamma = \frac{a}{m} = \frac{\text{activity}}{\text{molality of solution}}$$

$\therefore a < m$ for real solutions

$$\gamma < 1$$

$a = m, \gamma = 1$ for ideal solutions

For electrolyte $a = a_+ a_-$ = product of activity of ions.

The activity of individual ion cannot be determined hence mean ionic activity (a_{\pm}) is considered

$$a_{\pm} = \sqrt{a} = \sqrt{a_+ a_-}$$

mean activity coefficient = $\gamma_{\pm} = \sqrt{\gamma_+ \gamma_-}$

$$a_{\pm} = \sqrt{\gamma_+ m_+ \times \gamma_- m_-}$$

for univalent ions $m_+ = m_- = m, \gamma_+ = \gamma_- = \gamma_{\pm}$

$$\sqrt{a} = \sqrt{m^2 \gamma_{\pm}^2}$$

$$a = m^2 \gamma_{\pm}^2$$