Azeotropes

Binary mixtures that have same composition in liquid and vapour phase and boil at constant temperature and their composition can not change on distillation are known as azeotropic mixtures.

Azeotropes

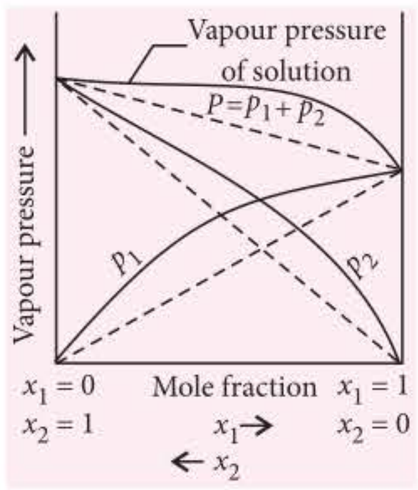
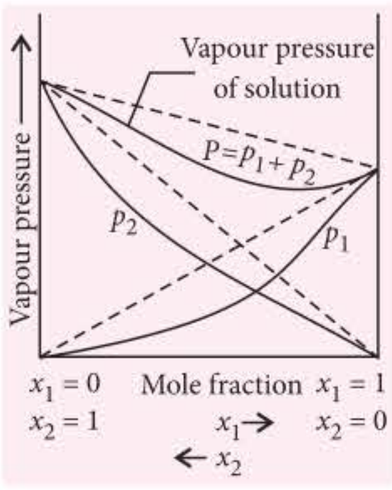
Maximum boiling azeotropes

The non-ideal binary solutions which show negative deviation from Raoult's law.

Minimum boiling azeotropes

The non-ideal binary solutions which show positive deviation from Raoult's law.

Non-ideal Solutions showing Positive and Negative Deviations from Raoult's Law

Solutions showing positive deviation	Solutions showing negative deviation
When total vapour pressure is more than expected by Raoult's law.	When vapour pressure is less than expected by Raoult's law.
$A - B << A - A$ or $B - B$ interactions	$A - B >> A - A$ or $B - B$ interactions.
$\Delta H_{mix} > 0, \Delta V_{mix} > 0$	$\Delta H_{mix} < 0, \Delta V_{mix} < 0$
$p_1 > p_1^\circ x_1 ; p_2 > p_2^\circ x_2$	$p_1 < p_1^\circ x_1 ; p_2 < p_2^\circ x_2$
Examples : Ethanol and acetone, Carbon disulphide and acetone, Methanol and water, Cyclohexanol and cyclohexane. 	Examples : Phenol and aniline, Chloroform and acetone, Chloroform and diethyl ether, Chloroform and benzene, Water and H_2SO_4 or HNO_3 or HCl. 

Colligative Properties

The properties which depend upon the number of the solute particles irrespective of their nature related to the total number of particles present in the solution are known as colligative properties.

Colligative Properties

Depression in freezing point

By adding non-volatile solute, freezing point of solution decreases.

$$\Delta T_f = iK_f m = iK_f \left(\frac{w_2 \times 1000}{M_2 \times w_1(g)} \right)$$

K_f = Molal depression constant
ΔT_f = Depression in freezing point
m = Molality

Elevation in boiling point

By adding non-volatile solute, boiling point of solution increases.

$$\Delta T_b = iK_b m = iK_b \left(\frac{w_2 \times 1000}{M_2 \times w_1(g)} \right)$$

m = Molality
ΔT_b = Elevation in boiling point
K_b = Molal elevation constant

Relative lowering of vapour pressure

$$\frac{P^\circ - P_s}{P^\circ} = x_B = \frac{n_B}{n_A + n_B} = \frac{w_B \times M_A}{M_B \times w_A}$$

x_B = Mole fraction of solute

Osmotic pressure

The osmotic pressure of solution depends on its concentration.

$$\pi = CRT = \frac{n_B}{V} RT = \frac{w_B RT}{M_B V}$$

Isotonic solution

Two solutions having same osmotic pressure at a given temperature.

Hypotonic solution

If a solution has less osmotic pressure than other solution, it is called hypotonic solution.

Hypertonic solution

If a solution has more osmotic pressure than other solution, it is called hypertonic solution.

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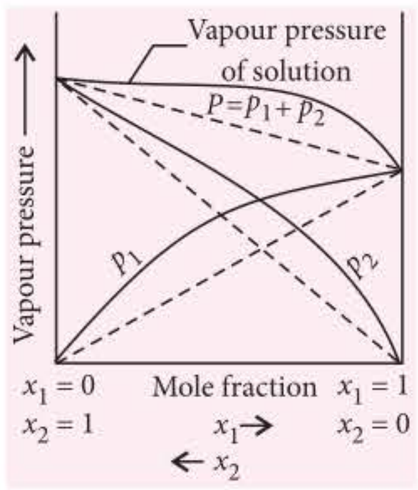
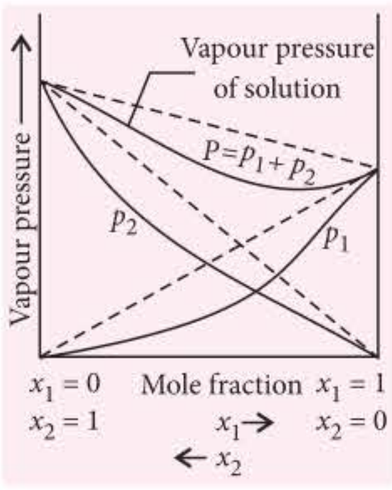
Examples : Ethanol and acetone, Carbon disulphide and acetone, Methanol and water, Cyclohexanol and cyclohexane. 	Examples : Phenol and aniline, Chloroform and acetone, Chloroform and diethyl ether, Chloroform and benzene, Water and H_2SO_4 or HNO_3 or HCl. 

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m = Molality
ΔT_b = Elevation in boiling point
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