MODULE- 4

MASS TRANSFER

Q1: What is the difference between convective mass transport and diffusive mass transport?

A1: The convective mass transport causes due to bulk motion of molecule while diffusive mass transport causes due to difference in chemical potential (e.g. concentration difference).

Q2: Is absolute fluxes are converged?

A2: No.

Q3: Is relative fluxes are converged?

A3: Yes

Q4: Is Fick's law of diffusion is universal and applicable for all cases?

A4: No, it is applicable only for binary systems and where diffusivity is constant.

Q5: Write the cases when Fick's law of diffusion is not applicable?

A5: Fick's law of diffusion is not applicable for the multicomponent system. It is also not applicable if the coupling effect between fluxes of different components are significant.

Q6: Write the other approaches to solve mass transport problems?

A6: Stefan Maxwell equation and non-equilibrium thermodynamic approach.

Q7: Give the cases where we can use Fick's law for multicomponent system?

A7: If compositions of different components in a multi-component system are not changed significantly, we may assume constant diffusivity of a component against a mixture of other components.

Q8: What is the driving force in mass transport problem?

A8: The chemical potential which may include pressure difference, concentration difference, temperature difference etc.

Q9: Why equation of continuity is always used in mass fraction rather than in moles fractions?

A9: The moles of any system may not converged (in case of chemical reaction) but mass of any system is always converged.

Q10: What is effect of temperatures and pressures on diffusivity?

A10: According to Chapman-Enskong theory, diffusivity of gases at low density is directly proportional to $T^{3/2}$ and inversely proportional to the pressure P. Wilke-Chang correlation states that diffusivity of liquids is directly proportional to temperature only

Q11: Define microscopic and macroscopic balances?

A11: Macroscopic balances of momentum, mass and energy at macroscopic level is called macroscopic balances. Microscopic balances can be applied for smaller scale description than macroscopic but larger than molecular one. It involves phenomenological approach (Fick's law, Fourier's law and Newton's law) for system analysis. Differential equations are formulated for momentum, mass and energy transport as a result of application of conversation laws. Continuum approach is used in macroscopic balances.