Terminologies

Compaction: Compression of membrane structure due to a pressure difference across its thickness, causing a decrease in membrane permeability.

Concentration polarization: Development of a concentration gradient of the retained components across the boundary layer near the membrane surface.

Cross flow: Mode of operation where the feed flows parallel to the membrane, while the permeate has a transverse flow direction.

Dead end: Mode of operation where the whole feed is forced to pass through the membrane.

Fouling: Phenomenon in which the membrane adsorbs or interacts in some manner with solutes in the feed stream, resulting in a decrease in membrane performance.

Flux: Volume or mass of permeate or of any component in the permeate, passing through the membrane per unit area and unit time.

$$J_w = \frac{P}{(\Delta p - \Delta \pi) l}$$

where, P is permeability coefficient, Δp is the hydrostatic pressure difference, $\Delta \pi$ is the osmotic pressure difference between feed and permeate phases and l is the membrane thickness.

Housing: The vessel in which a membrane element is placed with ports and fittings to direct the feed, retentate and permeate streams through the membrane element.

Mass transfer coefficient: A measure of the solute's mobility due to forced or natural convection in the system. It is defined as the ratio of the diffusive solute flux at the membrane surface $(-D\ \partial C/\partial y)_w$, to the overall concentration driving force for diffusion $(C_w - C_b)$.

$$k = \frac{-\left(D\frac{\partial C}{\partial y}\right)_w}{C_w - C_b}$$

where, D is binary solute diffusion coefficient, C is local solute concentration, y is fluid velocity in transmembrane direction, C_w and C_b are the solute concentrations at the membrane surface and in the bulk solution, respectively.

Module: It refers to the membrane and its housing.

Molecular weight cut off (MWCO): The smallest molecular weight species for which the membrane has > 90 % rejection.

Permeability: The flux of a component through the membrane per unit driving force.

$$K = \frac{J_w}{\Delta P}$$

where, K is permeability, J_w is flux ($l.m.^{-2}h.^{-1}$) and ΔP is transmembrane pressure

Permeate: The portion of the feed passing through the membrane.

Retentate: Portion of the feed not passing through the membrane.

Rejection: A measure of how well a membrane retains or allows passage of a solute.

$$\%\,R = \left[1 - \left(\frac{C_p}{C_f}\right)\right] \times 100$$

where, C_p is concentration of the permeate, while C_f is the feed concentration.

Spacers: A mesh like material used in flat sheet modules (e.g. plate, spirals, pleated sheet) to separate successive layers of membranes. Spacers control the feed channel dimensions in these modules.

Trasmembrane pressure: The driving force for flux. In cross flow systems, it is measured as the average of the inlet and outlet pressures, minus permeate backpressure.