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OSMOSIS

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Osmosis is the process of diffusion of solute from a less concentrated solution into a more concentrated solution [1].

The phenomenon of osmosis is observed in those media where the mobility of the solvent is greater than the mobility of the dissolved substances. An important special case of osmosis is osmosis through a semi-permeable membrane. Semi-permeable membranes are membranes, which have a sufficiently high permeability not for all, but only for some substances, in particular, for the solvent. (The mobility of dissolved substances in the membrane tends to be zero.) If such a membrane separates a solution and a pure solvent, the concentration of the solvent in the solution is lower, because there a part of its molecules is replaced by molecules of the solute. As a consequence, the transition of solvent particles from the department containing the pure solvent to the solution will be more frequent than in the opposite direction. This means that the volume of the solution will increase (and the concentration will decrease), while the volume of the solvent will decrease accordingly.

For example, an egg shell has a semi-permeable membrane on the inside: it lets in water molecules and retains sugar molecules. If such a membrane separates sugar solutions with concentrations of 5% and 10% respectively, only water molecules will pass through it in both directions. As a result, the more diluted solution will have a higher sugar concentration, while the more concentrated solution will have a lower sugar concentration. When the concentration of sugar in both solutions is the same, there will be equilibrium. If you take a baggie with fine pores that allow only solvent molecules (such as

water) through, but do not allow sugar molecules through, the water molecules will diffuse into the baggie, increasing the volume of solution in the baggie. If the pouch is connected to a glass vertical tube, the solution begins to rise up the tube until the pressure produced by the water in the tube equals the osmotic pressure of the sugar solution.

It is osmotic pressure that explains the paradoxical facts of flowers and even brittle mushrooms sprouting from asphalt. Plant cells also use osmosis to increase the volume of the vacuole so that it expands the cell walls (turgor pressure). Plant cells do this by storing sucrose. By increasing or decreasing the sucrose concentration in the cytoplasm, they can regulate osmosis. This increases the elasticity of the plant as a whole. Many plant movements (e.g. movements of whiskers of peas and other climbing plants) are associated with changes in turgor pressure [2].

The world's first power plant using the osmosis process to generate electricity opened on 24 November 2009. Norway. Salted seawater and freshwater are separated in the plant by a membrane; as the salt concentration in seawater is higher, osmosis occurs between salted and freshwater, so that the salted water pressure rises spontaneously.

As the pressure of the osmosis saline water is greater than the atmospheric pressure, a powerful water flow is created, which drives a hydro-turbine to produce energy.

References

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