OPEN ACCESS Freely available online

ISSN: 2155-9589
Journal of Membrane Science & Technology

Opinion Article

# Membrane Technology's Importance and Classification

**Mohsen Mehri***

*Department of Science, University of Beni-Suef, Beni-Suef, Egypt*

## DESCRIPTION

A membrane is a selective barrier that allows several objects through but stops others. These could be molecules, ions, or other small particles. Membranes are divided into two types: Synthetic Membranes (SM) and Biological Membranes (BM). Biological Membranes (BM) include cell membranes (the outer coverings of cells or organisms that allow specific elements to pass through), Nuclear Membranes (NM) (which cover the nucleus of a cell), and Tissue Membranes (TM) such as mucosal membranes and serosae. Humans have developed synthetic membranes used for laboratories and industry (such as chemical plants).

The level of selectivity of a membrane is determined by the size of the membrane pore. They are classified as Micro-Filtration (MF), Ultra-filtration (UF), Nano-Filtration (NF), and Reverse Osmosis (RO) membranes based on pore size. Membranes can also be different in thickness and have a homogeneous or heterogeneous structure. Particle transport can be active or passive, and membranes can be neutral or charged. The latter can be facilitated by the membrane component's pressure, concentration, chemical, or electrical gradients. The cell membrane is also called as the plasma membrane, is present in all cells and to separate the cell nucleus surface from the external environment. The cell membrane is generally made up of a semipermeable lipid bilayer. The cell membrane controls the transport of materials within and outside the cell.

## CLASSIFICATION OF MEMBRANE PROCESSES

### Micro Filtration (MF)

Micro Filtration (MF) means removing molecules higher than 0.08-2 µm and operates at pressures ranging from 7 to 100 kPa. Micro filtration is used to remove the residual Suspended Particles (SP), to condition water for effective purification, and as a pre-treatment procedure for Reverse Osmosis (RO). Membrane Bioreactor's (MBR) are relatively new developments that combine micro filtration and a bioreactor for biological treatment.

### Ultra Filtration (UF)

Ultra Filtration (UF) means removing particles higher than 0.005-2 µm and operates at pressures ranging from 70 to 700 kPa. Many of the same applications as micro filtration are served by ultra-filtration. However many ultra-filtration membranes have been used to selectively remove high-molecular-weight compounds such as proteins and carbohydrates. They can also remove viruses and some endotoxins.

### Nano Filtration (NF)

Nano Filtration (NF) is also known as "loose" Reverse Osmosis (RO) membrane, can reject molecules smaller than 0,002 µm in size. Nano filtration is used to remove particular dissolved elements from wastewater. It has been developed mainly as either a membrane emulsification method that provides an alternative to chemical softening. Similarly, Nano filtration can be used as a pre-treatment stage before Reverse Osmosis (RO) membranes. The main objective of NF pre-treatment are to: (1) Reduce suspended particles and micro-organisms contaminants of RO membranes by removing impurities and bacteria, (2) Reduce scalability by removing durability ions, and (3) Decrease the operating temperature of the RO technique by reducing feed-water Total Dissolved Solids (TDS) composition.

### Reverse Osmosis (RO)

Desalination is commonly accomplished by Reverse Osmosis (RO) membrane. Moreover, RO is commonly used to remove dissolved substances from wastewater that remains after additional treatment of micro filtration. RO means removing ions but produces deionized water at high pressures (850–7000 kPa). RO is the most widely used desalination technology because of its simplicity of operation and low energy consumption when compared to distillation, which uses thermal

**Correspondence to:** Mohsen Mehri, Department of Science, University of Beni-Suef, Beni-Suef, Egypt, E-mail: Mehri.mohsen@gmail.com

**Received:** 01-Jul-2022, Manuscript No. JMST-22-17760; **Editor assigned:** 04-Jul-2022, Pre QC No. JMST-22-17760 (PQ); **Reviewed:** 18-Jul-2022, QC No. JMST-22-17760; **Revised:** 25-Jul-2022, Manuscript No. JMST-22-17760 (R); **Published:** 04-Aug-2022, DOI: 10.35248/2155-9589.22.12.289.

**Citation:** Mehri M (2022) Membrane Technology's Importance and Classification. J Membr Sci Techno. 12:289.

processes. It is important to note that reverse osmosis membranes remove water elements at the ionic level. To obtain this current RO system uses a Thin-Film Composite (TFC) made up of three layers: A polymeric layer, a polysulphone layer, and a polyester layer.

## Membranes with nanostructures

Different types of membranes are using nanostructure channels to separate materials at the molecular level. Carbon nanotube membranes, graphene membranes, Polymers with Intrinsic Micro (PIM's) porosity membranes, and membranes are examples Metal-Organic Framework's (MOFs). These membranes can be used for size selective separations for example nano-filtration and reverse osmosis, as well as adsorption selective separations like separating carbonyl compounds from aromatic hydrocarbons and alcohols from water, which have typically required expensive and energy intensive distillation.