

DEVELOPMENTS IN EFFLUENT TREATMENT – PART III

REF: TT/ NOV 2021/ WK 1

Membranes used in Reverse Osmosis

In Reverse osmosis, the specially designed membranes remove the impurities from the water feed without the use of chemicals, resins, or ion exchange beds. The types of membranes used in RO process are Cellulose acetate, Polyamide, Thin film composite membranes.

Composite membranes use a thin film of polyamide or similar kind of layer formed upon a porous substrate of a material such as Polysulfone. The porous surface provides mechanical strength and the separation is done by the thin top-layer.

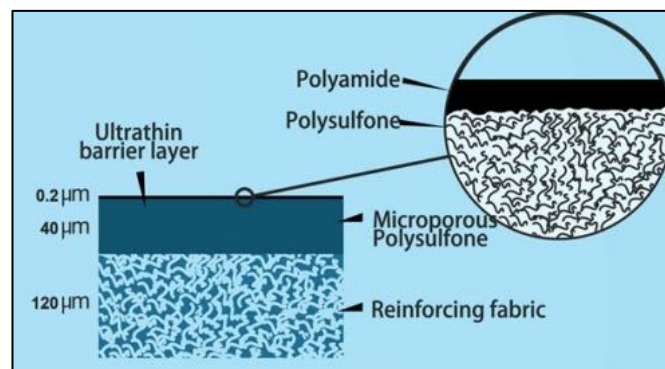


Fig 1.1 Thin film composite membrane

Ref: osmotechmembrane.com

The cellulose acetate and polyamide membranes are formed a one stage process. In this, an outer thin dense active layer is supported by a thick porous layer of the same material. The cellulose acetate membrane is cast into a supporting fabric to provide mechanical strength for handling. The polyamide hollow fibers are of very less thickness.

Membranes based filtration technology

This technology has the capacity to separate dye continuously from effluent. In Reverse Osmosis, problems with fouling are present which result into poor separation. RO also becomes less effective when osmotic pressure, caused by high salt concentration in the feed wastewater.



To overcome this, **Nano Filtration technology** is used as an alternative. This technology is used in recovery of salt from used dyeing baths, where the principle is that electrolytes will pass through the membrane, as the dyes will be rejected. However, this principle requires the use of sufficiently small electrolytes. Like Glauber’s salt which is used as electrolyte is rejected by the Nano Filtration membrane, which is a limitation of this technology.

Nano filtration membranes retain organic compounds of low molecular weight, divalent or monovalent ions like hydrolyzed reactive dyes and dyeing auxiliaries. This helps to remove the macromolecules and particles. There are few challenges also associated with it. The concentrated residue left after separation poses disposal problems, which may also cause clogging and subsequently may lead to membrane replacement. This method of filtration is suitable for water recycling within a textile dye plant if the effluent contains low concentration of dyes, but it is unable to reduce the dissolved solid content.

Micro filtration is suitable for treating dye baths containing pigment, dyes as well as subsequent washing-off processes.

Ultrafiltration is another filtration technology. It permits the separation of small particles and dissolved molecules from liquids or wastewater. The separation depends on molecular size and the permeability might be affected by the chemical, molecular or electrostatic properties of the sample. Ultrafiltration is a membrane filtration technique in which hydrostatic pressure forces a liquid against a semipermeable membrane. Suspended solids and solutes with a high molecular weight are retained, while water and low molecular weight solutes pass through the membrane. Ultrafiltration is commonly used to retain macromolecules from aqueous solutions and to remove un-dissolved, suspended or emulsified solids from water. Cellulose acetate (CA) and polyelectrolytes are among the first synthetic polymers used for Ultrafiltration membranes.

References:

1. <https://www.sciencedirect.com/>
2. <http://www.soeagra.com/>
3. <https://www.ionindia.com/>
4. <https://www.ceeindia.org/>

.....To be continued.....

UNSCRAMBLE THE JUMBLE WORDS
ARNEBMEM
GGGLOCIN
DEDSUSENP
TSRIF

Last week’s Answers: 1) GRAVITY 2) EXCHANGE 3) PRIMARY 4) CERTAIN

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