Abstract:

Preparation, characterization and performance of membranes by polymer blends, interfacial polymerization and inorganic additive were carried out in detail in this study. Four different types of polymers polysulfone (PSF), polyacrylonitrile (PAN), cellulose acetate phthalate (CAP) and polyvinylidene fluoride (PVDF) were used as base polymers.

Effects of polyethylene glycol (PEG) as an additive to PAN-CAP blend membrane in flat sheet configuration were investigated. Influences of both the molecular weight and concentration of PEG were examined in these class of ultrafiltration (UF) membrane. The aim was to enhance the hydrophilicity of the resultant membrane further by incorporating hydrophilic PEG. The antifouling characteristics of the prepared membranes have been examined using bovine serum albumin (BSA) solution. Since hollow fibers were directly scalable, effects of PEG on PAN-CAP blend hollow fiber membrane were also observed. The developed membrane has been used for clarification of bottle gourd juice. Nanofiltration (NF) grade hollow fiber membrane was prepared by incorporation of $ZnCl_2$ into PSF–PEG (molecular weight 200) blend in one step. Performance of NF membrane was tested in terms of rejection of monovalent and divalent salts and various dyes. PSF−PVDF blend hollow fiber UF membrane were developed. This membrane has been used for aqueous extraction of (−) epigallocatechin gallate (EGCG) from green tea leaves. A suitable UF hollow fiber membrane was identified for improving the purity of EGCG and total polyphenols.

PSF based NF hollow fibers upto 360 Da cut off were prepared by interfacial polymerization using meta-phenylenediamine (MPD) and trimesoyl chloride (TMC) with PSF. Increase in TMC concentration reduced the molecular weight cut-off (MWCO) and average pore size of the membrane. A textile effluent containing four reactive dyes and salt was successfully treated by this hollow fiber. A completely predictive steady state multicomponent model was developed to quantify the system performance.

Nickel iron oxide nanoparticle incorporated hollow fiber mixed matrix membrane (MMM) was prepared to achieve high throughput as well as high selectivity for heavy metals by enhancing adsorption capacity of the membrane. These membranes were used for treatment of battery effluent. Lanthanum cobalt oxide

nanoparticle doped UF hollow fiber MMM membrane was developed and this membrane was capable to remove salt like a NF membrane at higher throughput and lower TMP. Efficiency of membrane was evaluated by desalination of synthetic as well as real life seawater.

Keywords: *Ultrafiltration; nanofiltration; polymer blend; surface modification; mixed matrix membrane; nanoparticles; adsorption; textile effluent treatment, desalination; heavy metal removal; sea water*.