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Modifi cation and characterization of prepared polysulfone ultrafiltration membranes via photografted polymerization: Effect of different additives

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ABSTRACT

The modified ultrafiltration (UF) membranes were prepared by graft polymerization of acrylic acid (AA) that is a hydrophilic monomer onto the surface of ultrafiltration membranes. Primary UF membranes were formed by wet phase inversion method by using polysulfone (PSf)/N-methylene-2-pyrrolidone (NMP)/ poly (ethylene glycol) (PEG) casting solution and water coagulant. PEG acts as a pore-former that in this study is used in a wide range of molecular weights (MW) from 600 to 20,000 Da. Changing the molecular weight of PEG additive, controls the structure and permeation properties of membranes. It can be observed that an increase in the molecular weight of PEG additive leads to an increase in water permeability. By increasing the irradiation time, rejection of dye and PEG increases, although solution permeability decreases. Increasing PEG rejection by increasing irradiation time shows the developing sieving mechanism by grafting and reduction in pore size. Grafting of AA onto membrane surface is confirmed by infrared spectra (IR). Scanning electron microscopy (SEM) images show a significant increase in membrane pore size than the one prepared from PEG 20,000 Da, but its permeability is not too high to attribute to incomplete exit of this additive. Modified membrane prepared from PEG600 (t_{irr} = 30 min and [AA] = 6%) have desirable performance in separation of these dyes but other membranes prepared from higher MW PEG are not effective in separation of dyes. It was observed that this membrane showed acceptable performance both in terms of flux and rejection and has the characteristics of a NF-type membrane.

Keywords: UV-grafting; Polysulfone; Acrylic acid; Poly (ethylene glycol); Dye

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