ERRATUM

Due to a clerical error, footnote notation was reversed during composition. Dr. Wenli Han is currently affiliated with Althin Medical, Inc., 14620 NW 60th Ave., Miami Lakes, FL 33014. Dr. Harry P. Gregor is deceased. A corrected page is reproduced (opposite). We apologize for any confusion this error has caused.

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Acrylonitrile Copolymers: Synthesis, Characterization, and Formation of Ultrafiltration Membranes

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ABSTRACT: A variety of poly(acrylonitrile-*co*-acrylamide) polymers of different compositions were synthesized by free radical copolymerization. Thin films were cast from polymer solutions, and coagulated into ultrafiltration membranes. The effect of preparative parameters on membrane gel structure was investigated. For nonsupported membranes, concentrated polymer solutions produce fine pore membranes with a lower flux; extending the drying time causes a diminution in membrane thickness, swelling index, and fluxes; the membrane thickness, swelling index, and permeate flux all increased with increasing coagulation bath temperature. For supported membranes, dilute polymer casting solutions, small casting gate opening, and added polyvinylpyrrolidone to the casting solution all increased the permeate flux. The membranes containing acrylamide were more hydrophilic, and had a smaller dispersion force component of the surface free energy than those prepared from the polyacrylonitrile homopolymer. © 1999 John Wiley & Sons, Inc. J Appl Polym Sci 74: 1271–1277, 1999

Key words: acrylonitrile copolymer; ultrafiltration; membrane casting; surface characterization

INTRODUCTION

Synthetic ultrafiltration (UF) membranes based upon cellulose acetate and other derivatives were well developed by the mid-1930s. Today, the synthetic membranes' range includes PVDF (polyvinylidine fluoride), PAN (polyacrylonitrile), the nylons and the polysulfones. Despite the many kinds of UF materials available today, the large-scale commercial utilization of UF has been hampered by the costs involved, largely due to the occurrence of membrane fouling, namely the adhesion of dissolved and suspended materials onto the hydrophobic polymer surfaces and the resulting flux decline. This is difficult to reverse except by extensive and often severe cleansing methods that add substantial costs to the process.

Interactions between solute-membrane and solute-solute species can be broadly classified as (1) polar interactions (e.g., H-bonding), (2) interactions due to dispersion forces, and (3) electrostatic interactions. Hydrophilic membrane materials are considered by some to have high surface-free energies, largely due to strong polar interactions; with some hydrophobic materials such as the fluorinated hydrocarbons considered by some to have low surface free energies.[1]

To circumvent membrane fouling problem, we have investigated the use of polymers containing hydrophilic moieties in various forms. By the use of the monomers and the polymers containing the strongly polar amide group of an extremely high

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