CHARACTERIZATION OF MICROPOROUS ECTFE MEMBRANE AFTER EXPOSURE TO DIFFERENT LIQUID MEDIUMS AND RADIATION

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Microporous ethylene chlorotrifluoroethylene (ECTFE) membranes subjected to caustic soaking, organic solvent soaking and irradiation were characterized in a variety of ways. Swellings of porous ECTFE membranes by methanol, ethanol, 2-propanol, tetrahydrofuran (THF), toluene, acetonitrile and tri-n-octylamine (TOA) were much larger than those of nonporous ECTFE films. Irradiated membrane samples appear to have almost no difference with respect to morphology, porosity, X-ray diffraction (XRD) pattern and tensile properties. However, slight variations were observed in bubble point pressure and energy loss measured in dielectric relaxation spectroscopy. Measurement of dielectric constant indicated membrane samples irradiated with the highest strength, 45 kGy, displayed some defects. After exposure to γ-irradiation, decreases of melting and crystallization enthalpies were observed for ECTFE membranes. Membranes treated with NaOH solutions have almost no effect on contact angle and bubble point pressure. Only the highest strength caustic solution, 3M, reduced the value of liquid entry pressure (LEP) by 13.8 kPag (2 psig). Investigations of the effect caused by a variety of organic solvents (methanol, ethanol, 2-propanol, 1-butanol, THF, toluene, acetonitrile and TOA) indicated that TOA caused significant defect as observed during analysis by scanning electron microscopy (SEM), differential scanning calorimetry (DSC) and XRD. Solvents THF, toluene, acetonitrile and TOA appear to slightly decrease the value of Young’s Modulus. Almost no difference was observed in the glass transition temperature (Tg) in the tests for virgin and solvent soaked ECTFE membranes. In comparison with polyvinylidene fluoride (PVDF) membranes, ECTFE membranes showed greater hydrophobicity, stronger wetting resistance as well as better ability to maintain hydrophobicity. In the solvent treatment studies with TOA, analysis by DSC and XRD indicated the presence of more significant defects in PVDF membranes.