

Solvent effect on post-irradiation grafting of styrene onto poly(ethylene-alt-tetrafluoroethylene) (ETFE) films

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Grafting of styrene followed by sulfonation onto poly(ethylene-alt-tetrafluoroethylene) (ETFE) was studied for synthesis of ion exchange membranes. Radiation-induced grafting of styrene onto ETFE films using different solvent was investigated after simultaneous irradiation (in post-irradiation condition) using a ^{60}Co source. The ETFE films were immersed in styrene/toluene, styrene/methanol and styrene/isopropyl alcohol and irradiated at 20 and 100 kGy doses at room temperature. The chemical changes were monitored after contact with styrene for grafting. The post-irradiation time was established at 14 days. After this period the grafting degree was evaluated in the samples. The grafted films were sulfonated using chlorosulfonic acid and 1,2-dichloroethane 20:80 (v/v) at room temperature for 5 h. The degree of grafting (DOG) was determined gravimetrically and physical and chemical changes were evaluated by differential scanning calorimeter analysis (DSC), thermogravimetric analysis (TGA), and also by scanning electron microscopy (SEM). The ion exchange capacity (IEC) of membranes was determined by acid–base titration and the values for ETFE membranes grafted in toluene solvent showed the best performance of sulfonation. Surface images of the grafted films by SEM technique (figure 1) have presented a strong effect of the solvents on the films morphology.

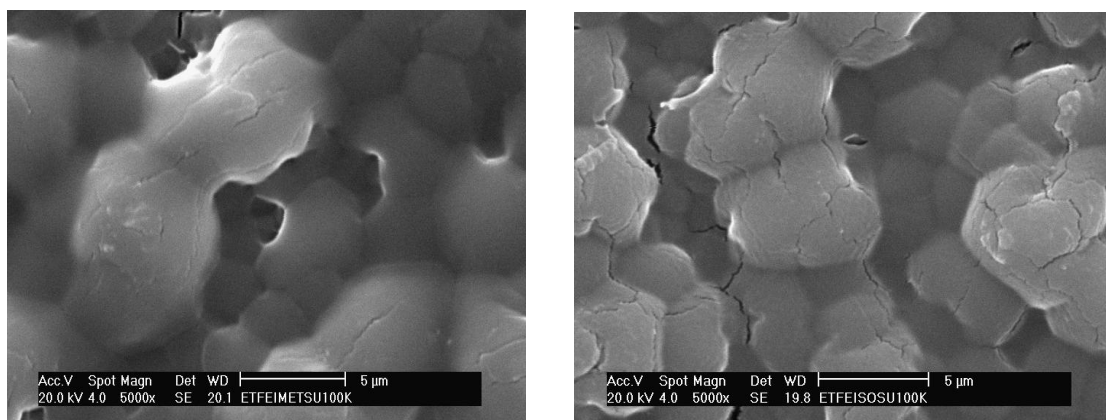


FIG 1: SEM images showing the holes and cracks of a surface in ETFE grafted in isopropyl alcohol. 5,000X magnification.