Grafting of styrene onto poly(tetrafluoroethylene-co-perfluoropropyl vinyl ether) (PFA) films for ion exchange membrane application

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Grafting of styrene followed by sulfonation onto poly(tetrafluoroethylene-co-perfluoropropyl vinyl ether) (PFA) was studied in the synthesis of ion exchange membranes. Radiation-induced grafting of styrene onto PFA films was investigated by simultaneous method using a 60 Co source. The films of PFA were irradiated at 20 and 100 kGy doses at room temperature and chemical changes were monitored after contact with styrene and graft. Films of PFA were immersed in styrene/toluene 1:1 v/v and were submitted to gamma radiation. After irradiation the samples were evaluated in order to observe the behavior of grafting degree. The grafting films were sulfonated using chlorosulfonic acid and 1,2-dicloroethane 2:98 (v/v) at room temperature for 5 h. Results were evaluated by infrared spectroscopic analysis (FTIR), differential scanning calorimeter analysis (DSC), thermogravimetric analysis (TGA) and the degree of grafting (DOG) was determined gravimetrically. The ion exchange capacity (IEC) of membranes was determined by acid-base titration. The structural changes showed that irradiated PFA films exhibited a much higher grafting degree at 100 kGy confirmed of all evaluation techniques. The IEC values for PFA films are higher than Nafion® films.

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