



THERMAL BEHAVIOUR OF POLYPROPYLENE MEMBRANES MODIFIED BY RADIATION-INDUCED GRAFTING POLYMERIZATION

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The thermal behaviour of polypropylene (PP) films modified by radiation-induced grafting of styrene onto PP using the simultaneous irradiation process was studied. The grafted membranes are applied as proton exchange membranes in fuel cell technology. Consequently, it is important to verify their thermal stability. The films were immersed in solution of styrene/toluene at the proportion 4:1. Nitrogen was bubbled to guarantee inert atmosphere. The samples were exposed to gamma irradiation at 40, 80 and 100 kGy doses, at room temperature. After graft reaction the films were kept at room temperature and inert atmosphere for periods of 7, 14, 21 and 28 days in order to evaluate the degree of grafting (DOG). At the end of grafting process the films were sulfonated to provide the hydrophilic property. The DOG was determined gravimetrically and the chemical changes in the grafted and sulfonated membranes were characterized by Fourier transform infrared spectroscopy (FTIR), Thermogravimetric measurement (TG), Differential Scanning Calorimeter (DSC). For the sulfonated samples the Ion Exchange Capacity was calculated. The greatest DOG was achieved after 21 days of post-irradiation. By TG the grafted films exhibited a decrease in the thermal stability, while the sulfonated ones exhibited an increase in the property. The DSC allowed verifies that the PP matrix didn't suffer drastic change in the melting temperature after grafting and sulfonation reactions. The IEC calculated shows that the new membrane has ionic conductivity property.

Sample	T _{onset} (°C)	T _{onsetsulf} (°C)
PP pure	434	-----
PP 40 kGy	405*	420
PP 80 kGy	399*	409
PP 100 kGy	400*	403

T_{onsetsulf}: initial degradation temperature after sulfonation process; * initial degradation temperature after DOG calculated.