

Sulfonation of polypropylene films for proton exchange membrane

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The sulfonation of polypropylene (PP) films was carried out after the styrene grafting onto PP films by the simultaneous irradiation method. The experimental part comprises PP films with 40 μ m thickness immersed in styrene/toluene (4:1, v/v) solution at room temperature and nitrogen atmosphere with exposition to gamma ionizing radiation. The irradiation doses used were 20, 40, 80 and 100 kGy. After irradiation process the samples were kept in the nitrogen, at room temperature at periods of 7, 14 and 21 days in order to observe the behavior of grafting yielding. In the sequence the grafting films were sulfonated using chlorosulfonic acid at room temperature for 15 minutes. Chemical and structural changes of the sulfonated PP films were characterized by infrared spectroscopic analysis (FTIR), differential scanning calorimetry analysis (DSC), thermogravimetric analysis (TGA) and the ion exchange capacity (IEC) of membranes which was determined by acid-base titration. Also the degree of grafting (DOG) was determined gravimetrically. The DOG value is higher for the film submitted at 100 kGy. The sulfonated films show a little decrease in the thermal stability when compared with the pure polymer. The IEC of sulfonated PP membranes is 1.3 meq g⁻¹ and the Nafion[®] value is 0.9 meq g⁻¹ (1).

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